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Contractors and Committee "D"

MONTH by month the Electricity Commissioners' returns show that the consumption of electrical energy continues to increase, and yet in his annual report Mr. W. R. Rawlings, president of the Electrical Contractors' Association, says that the business turnover of members of that organisation has decreased substantially.

The reason for this would seem to lie largely within the industry itself, for the prevalent depression, especially in the building trade, has brought with it a tendency to procure business at any cost and little, if any, profit. This has, naturally, led to a disregard of quality, which, unfortunately, has been fostered by those who have the placing of installation work, through their striving after cheapness.

This tendency, although perhaps accentuated, is not a new one. Mr. Rawlings, in accord with his predecessors, suggests that the remedy is the enforcement of a definite wiring code or compulsory registration.

But this is only one of the problems with which the electrical industry is faced—problems which should be capable of solution, and which, indeed, will *have* to be solved soon.

On many occasions the E.C.A. has pointed the way to peace and prosperity or taken the lead in securing better trading conditions. It has its dislikes, of course; municipal electricity supply authorities who do installation work are obnoxious to it, and the "kerbstone" or "jerry" contractor is anathema.

Successive Association presidents have preached the gospel of co-operation, and it was largely due to the contractors' influence that Committee "D" was formed under the 1926 Act as an endeavour to get electrical brethren to dwell together in unity.

When this Committee, after several years of labour, at last produced a draft policy, this, to use Mr. Rawling's words, "synchronised to an amazing degree" with the E.C.A. Trading Policy published in 1923. The Committee's draft was circulated quietly to the industry last year, and we felt that, at last, the warring factions would cease their strife, everybody's scope and limits would be defined, and henceforward no corns would be trodden on—for all would stand on their own feet, shoulder to shoulder.

We wondered why no more was heard of the policy from that time to this. Now Mr. Rawlings has let the cat out of the bag. The hopes entertained have not been fully realised, for "different interests, upon receipt of the draft, put forward divergent claims for revisions, and the matter is still being debated."

It thus appears as though matters remain exactly as they were, and we are tempted to ask why.

Committee "D" comprises fully accredited representatives of the manufacturers, wholesalers, contractor-retailers and supply authorities—company and municipal. If these have hammered out a policy which is possibly as near the mark as will be attained, and it is thrown over to the whole industry for revision, what hope is there of settlement?

It stands to reason that any compromise will not suit everybody at every point. But, surely, it is the duty of all branches to stand by their representatives, accept the policy, if only as a temporary arrangement, and give it a chance to prove its usefulness or uselessness to the industry.

Well might Mr. Rawlings call for a spirit of "give and take." We join him in appealing to the various sections of the industry to see that the work of a responsible body of men over a period of more than five years shall not be wasted.

Severity of Short-circuits

THE Senior Electrical Inspector of Factories, Mr. H. W. Swann, refers in his annual report to the higher standard of safety as compared with a few years ago, the number of electrical accidents being in no way at all commensurate with the greatly increased use of electricity. Most of the fatal accidents occurred, as in previous years, at from 200 to 250 V. a.c.; this is only to be expected, as the voltage range is that at which electricity comes within the field of use of unskilled persons. One problem that

comes increasingly to the fore is that of the functioning of control apparatus under the heavier short-circuit currents obtainable on modern supply systems. While such apparatus is generally being brought up to date in the power stations, the same thought is not given to the conditions on consumers' premises, which are at least as important in the promotion of safety. While it is essential that correct records should be kept of the short-circuit currents possible at various points on the system, it does not necessarily follow that the values will be much increased; the tendency to interpose two or more transformation stages between station and consumer has an important effect, and the growing use of overhead lines of higher reactance than underground cables should ease the situation in outlying areas.

Business Training

THE new Department of Business Administration which was started at the London School of Economics under Mr. Jules Menken has completed its first year's work. The movement is really a joint effort on the part of leading firms, including some electrical manufacturers, and the School authorities. It is financed mainly by business subscribers. Students enter either independently or as staff members of companies who wish to encourage them to fit themselves for positions of increased responsibility. The experiment, if such it can be called, is a very important one, both for young men and for the nation, especially at this particular period of our industrial life. Training for marketing and distribution, in which direct investigations of current practice have been made, is one of the first essentials. Students have been brought face to face with problems drawn straight from business experience, and the combination of practical commercial work and college discussion is strengthened by talks from and with leading business men and by visits to factories. The course has much in common with the "sandwich" system of college education and works apprenticeship in engineering. Two new courses—sales management and retail store management—are to be added next session. Mr. Menken will impart information either to firms or to students if they will communicate with him.

The Trolley Bus

THE case for the trolley bus as an alternative to both the tramcar and the petrol bus is clearly set out in a "Gazette" recently issued by E.D.A. The object is to assist the trolley bus to play its part in the provision of cheap, safe, and comfortable transport. It is not claimed that the system is the best in all circumstances; for, as we have often pointed out, its electrical and non-electrical rivals have each a field of their own. But its merits in its own field cannot be too often insisted upon; there are many towns in which obsolete tramways, unsuited now to particular localities, are being scrapped in favour of petrol buses, the case for the trolley bus having been allowed to go by default.

Overseas Visitors

THE conversazione at the I.E.E. to welcome members from overseas who are in the old country for the time being was an excellent way of seconding the work of the Overseas Activities Committee. It seems a long time now since we last saw Mr. Bernard Price at the Institution, and there were many others whom it was a pleasure for us to meet after a lapse of years. The 111 people present (including ladies) quite evidently appreciated the three lecturettes, which set forth the salient features of three outstanding British achievements in heavy power telephony and broadcasting.

The Two Voices

SIR FRANCIS GOODENOUGH'S latest pronouncement is unlikely to do much harm to our industry or good to his own. Gas has nothing much to fear from electricity, he thinks, and Ministers of the Crown are trembling on account of the cost of the grid. We have more regard for the spirit shown by Mr. James Bell, a gas undertaking manager, who declares that there is no room for both electricity and gas, frankly admits the defects of gas (with a view to their rectification), and fears the stimulus to electrical development due to the grid. Perhaps our two opponents are really of one mind with regard to the grid, but with two methods of attack. We have heard the Minister of Transport speak on many occasions lately, and the prospects of the electrical industry, as he sees them from an advantageous view-point, would certainly not cause him or any electrical man to tremble.

Safe X-Ray Apparatus

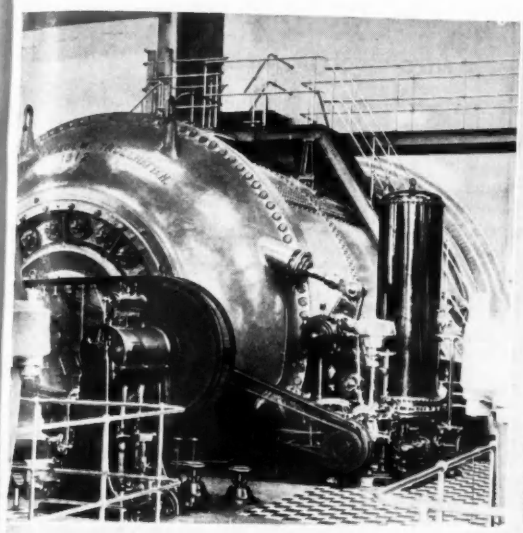
REPORTS of two accidents in connection with X-ray apparatus have reached us from Italy; in one of these the patient died, and in the other the operator was killed. Fear of possibilities of this kind is a distinct handicap to the use of electricity. Such fears ought to be groundless, as completely shock-proof equipment is available, but there are installations that leave very much to be desired on the score of safety in Britain also. This raises the question of the desirability of making it compulsory for the equipment of hospitals with X-ray apparatus to be governed by Home Office regulations, particularly in view of the tendency of medical knowledge to take precedence over electrical experience in the qualifications of the radiologist. Mr. Swann's report on the use of electricity in factories refers to collaboration between the Home Office and the Ministry of Health in making inquiries as to the design and use of electro-medical apparatus. We look forward to the publication of the results of this joint investigation.

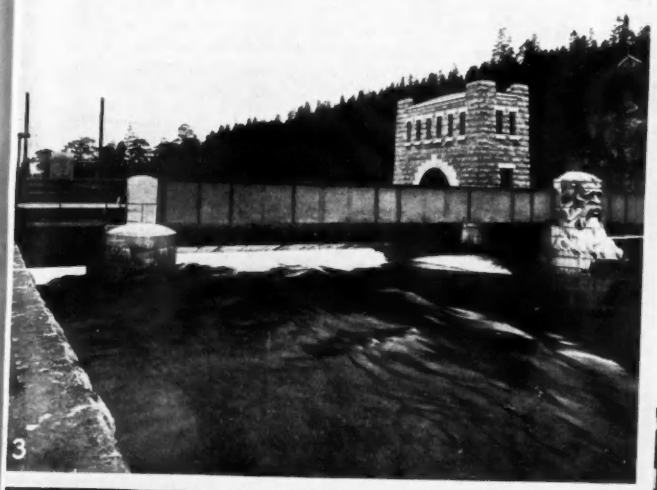
Tariffs for Tramways

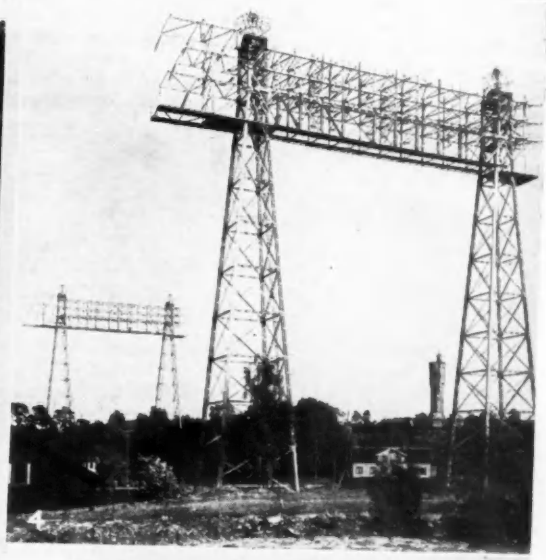
RUNNING through the discussions at the annual conference of the Municipal Tramways and Transport Association was a distinct feeling that the charges for electricity supplied for street traction have been, and in many cases are still, excessive and inequitable. The subject was referred to in the presidential address and supplied the theme for the paper read by Mr. C. Furness. Mr. Furness has the advantage of looking at the subject from the dual point of borough electrical engineer and of tramways manager, and has collected a large amount of data which shows that something is very wrong. In most cases it is that political considerations have been allowed to influence what should be a matter of economics. In the early days the tramways were regarded as a useful milch cow for the struggling electricity undertaking. Now that the latter is financially the stronger the time has come—in face of competition of the motor bus—to rectify the position. We do not suggest that politics should dictate the granting of uneconomic tariffs to the tramways, but we do submit that the terms should be on all fours with those allowed to industrial consumers with equivalent load and diversity factors.

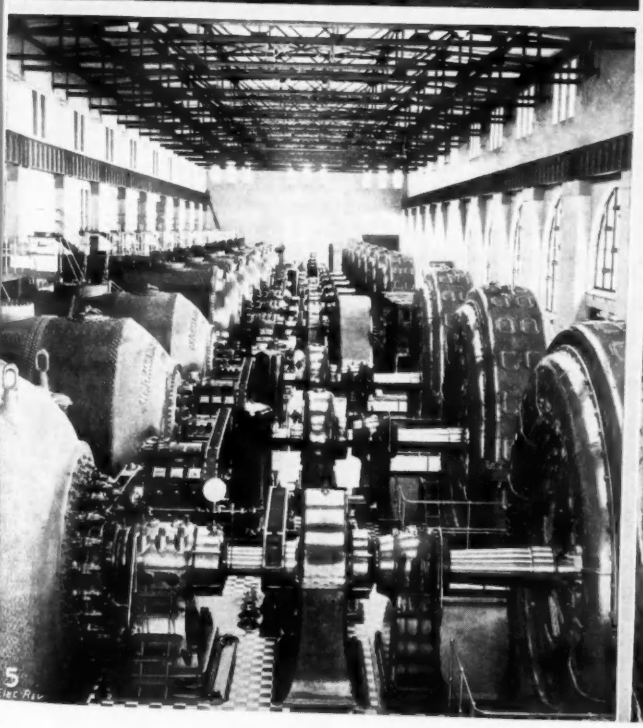
Explaining Power Factor

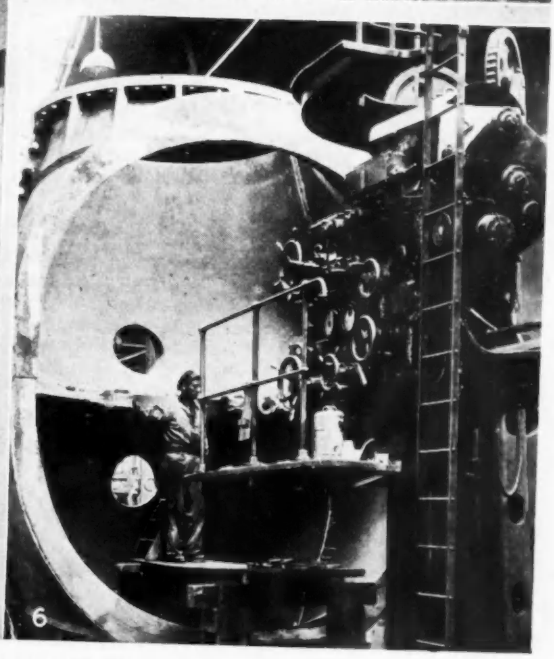
MANCHESTER Corporation Electricity Department has attempted what many have hitherto regarded as an impossibility. The Power Sales Section has issued, as a special supplement to its monthly Power Service Bulletin, an explanation of power factor with a view to convincing the industrial consumer that power-factor correction is profitable to him. Some of the contents will be beyond the range of many consumers without the sympathetic co-operation of the supply engineers (to whom also the pamphlet will be useful), but the ingenious comparison of active and idle kWh to worker bees and drones should be easy to follow. Apart from the more technical aspects, there will be plenty to interest the most hard-headed in the examples given of money saved through the installation of corrective plant, descriptions of the various types of which are given. This publication is a step in the right direction. Every opportunity must be taken to convince industrial consumers of the advantages of good power factor.











Sweden's largest hydro-electric plant—the Trollhattan power station

1. The new No. 5 unit. 2. Exterior of the power house. 3. The regulating dam. 4. Two of the transmission-line towers. 5. A general view of the inside of the power house. 6. The draft chest in course of construction.

Trollhättan Power Station. By G. Willock

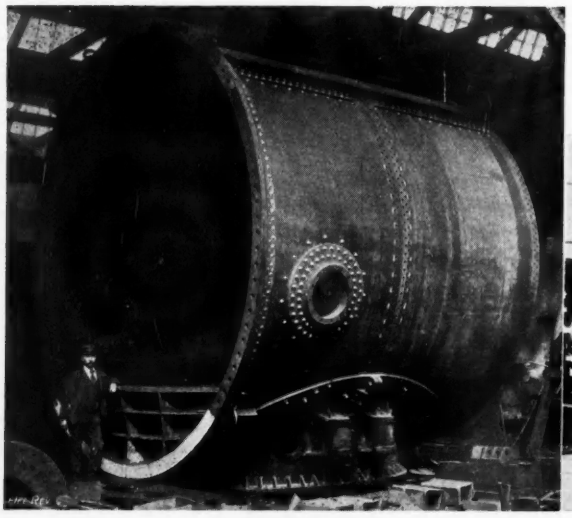
The modernisation of Sweden's largest hydro-electric plant

THE Trollhättan power plant is the largest of the Swedish hydro-electric plants. It is owned by the Royal Board of Waterfalls and is situated on the Gotha River about 8¾ miles below Lake Vänern and 47 miles up the river from Gothenburg, at which point the falls cover a distance of three-quarters of a mile, and the total gross-head is 103½ ft.

The regulating dam consists of two roller dams, each 66 ft. long, and six sluice-gates with a total opening of 79 ft. The intake to the head-race is situated at a short distance upstream from the regulating dam to the right of the latter and at right-angles to the flow of the river. The head-race has a cross-sectional area of 2,690 sq. ft. at normal water level, but after a stretch of some 1,150 ft. it divides into two separate head-races with lengths of 3,120 and 3,280 ft. and cross-sectional areas of 1,615 and 1,080 to 1,290 sq. ft. respectively. The smaller head-race passes through a tunnel for some 560 ft. just before it enters the forebay.

Each head-race enters its own forebay, the larger supplying water to eight main units and the three auxiliary units, and the smaller to five main units. Between the two forebays there is an overflow, common to both, and during the winter all ice-floes are diverted into the larger head-race, where the two head-races branch, and passes down the former to the forebay, where they are turned into the overflow and by-passed into the river just above the power-house.

The penstock-house has one intake chamber for each penstock. The penstocks to the eight main units have diameters of 14 ft. and lengths of 215 ft. Those for the other five main units have the same diameter with lengths varying from 230 to 210 ft. The penstock to the auxiliary units is 4 ft. in diameter and 215 ft. long.



Pressure casing

The Existing Installation

The first four units were put into service in 1910 and the last unit in 1920. The complete plant then consisted of: Eleven horizontal cylinder-case double-runner 12,500-b.h.p., 187.5-r.p.m. Francis turbines, driving eight three-phase 11,000-kVA, 11-kV, 25-cycle alternators, and three similar 50-cycle alternators, and two similar 13,200-b.h.p. turbines, each driving two three-phase 13,500-kVA, 11-kV alternators, one 25-cycle and one 50-cycle. For lighting, excitation, and driving the auxiliaries there are three horizontal single-runner 500-b.h.p. 410-r.p.m. Francis turbines direct-coupled to 350-kW 220 to 300-V d.c. generators; there is also a 4,750-Ah battery.

The power house is 480 ft. long and 75 ft. wide and is constructed of red Swedish granite. The energy generated is transmitted by cables in tunnels from the generators to the switch and transformer house. The latter houses, besides control room, laboratory, repair shop, etc., three 44,000-kVA, 10/50-kV, 25-cycle transformer banks, a 22,000-kVA, 10/50-kV, 50-cycle transformer bank, and 10 and 50 kV, 25 and 50-cycle switchgear. The outdoor transformer station comprises three 48,000-kVA, 10/130-kV, 50-cycle, three-phase transformers, and 130-kV switchgear. From the transformers the energy is transmitted by 10-, 50-, and 130-kV overhead lines.

A few years ago it was decided to modernise units Nos. 3 and 4 with a view to increasing their output to 16,000 b.h.p. each and at the same time to increase their efficiency. This alteration was carried out in 1930 and gave the results expected. Messrs. Nydqvist & Holm, Ltd., Trollhättan, also received an order to modernise one of their units (No. 5).

The Reconstructed Unit

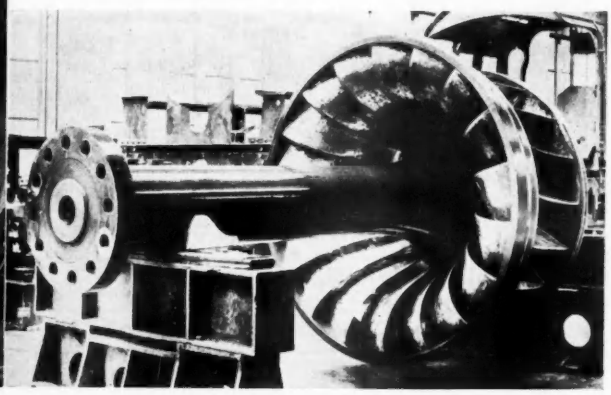
This firm first made a model turbine complete in all detail, the pressure casing and draft-tube being in exact proportion to those belonging to the actual unit. To ensure that a smooth and even flow would be given to the water on its passage from the penstock to the runners, all uneven surfaces between the draft chest and the regulating-rings were encased with steel plate, which was also carried out in the actual unit.

The pressure casing is similar to that of the old set, except that the end-cover has been moved out some 10 in. and a distance piece inserted, due to the overall length of the new unit being slightly more than that of the old one. In the old unit there is a bearing and inspection chamber inside the draft-chest, but in the new unit this has all been done away with and the water has a clear and unobstructed passage.

The old runners were of cast-steel each with nineteen steel-plate buckets, and had a diameter of 5 ft. 11 in., while the new runners are 6 ft. 4 in. in diameter and have eighteen buckets of stainless steel plate. Each runner has twenty gates with a height of 21½ in. for the old unit as compared with 25½ in. for the new. The regulating mechanism is now of the internal pattern, instead of the former external type.

Operating Efficiencies

The modernised alternator, supplied by the Swedish General Electric Co. (A.S.E.A.), which carried out the alterations, consists of a double generator, viz., the existing 11,000-kVA 25-cycle machine combined with a new 16,500-kVA 50-cycle alternator. This entails a new hub and shaft for the old unit, new bearings, and a new exciter. The latter is a chain-driven double machine, one for the 25-cycle and one for the 50-cycle alternator, mounted on a common bedplate. The replacement was completed in the latter part of 1931.



A new runner

The efficiency at different b.h.p. loadings ranged from 82.3 per cent. at 12,500, to 77.5 per cent. at 5,000; at 8,000 it was 84 per cent. For the modernised unit the corresponding figures obtained on test were 90.6 per cent. at 12,500, and 83.5 per cent. at 8,000; the most efficient load was 15,000 at 91.6 per cent., and at the maximum load of 17,800 the efficiency was 83 per cent, the net head being 100 ft. The replacement gave 1,780 b.h.p. more than that contracted for, and the efficiency at 15,000 b.h.p. was 1.1 per cent. better than the guaranteed figure, and was higher at all other loads. The result is that 1,000 additional b.h.p. is obtained with the same quantity of water—enough to pay the whole cost of replacement in a very short time.

Messrs. Nydqvist & Holm have now received an order for four more replacements. This means that the gain in output obtained from these five units and the rebuilt units Nos. 3 and 4 mentioned above will be 33,500 b.h.p., increasing the total output of the plant from 163,900 to 197,400 b.h.p. It is possible that three more units will be replaced later on.

When the replacement was planned, it was calculated that the existing oil-pressure governors would be able to regulate the replaced unit, and if the full load output had been 16,000 b.h.p. or slightly more it would have been of sufficient capacity. Due, however, to the fact that the full load output was much in excess, the governor was just on the small side. This has been rectified by fitting an extra auxiliary servo-motor on the governor, at a very slight cost.

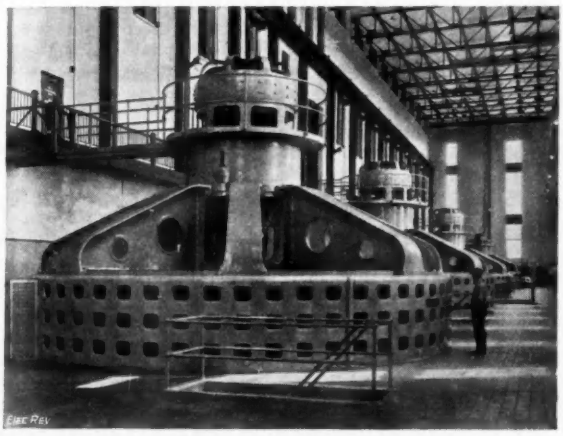
Canada and the Ottawa Conference

By Our Special Commissioner

THE whole Empire hopes that the Imperial Economic Conference at Ottawa this month will prove to be a starting point for better days than those through which the world is now passing.

If the United States can be taken as any criterion of the attitude of countries outside the Empire, then indeed almost the whole world is preparing to note carefully what takes place in Ottawa—and well it may, for if the hopes of the people of the Empire are realised, the results are bound to be observable in foreign countries. It is a great tribute to the stability of the institutions and methods established in the British Empire that Canada, during recent months, has not been more adversely affected by happenings in the United States, where bank failures, disregard of law, and other disturbing elements are rife.

As evidence of the great interest which has been aroused here by the decision to hold the Conference in Canada it may be pointed out that—in addition to the (now daily) newspaper references to it—Boards of Trade, Chambers of Commerce, and individual producers and manufacturers are all taking an active part in the preliminaries.



Hydro-electric generators in the Farmer's Rapids station of the Gatineau Power Co., Quebec

In certain lines—motors, transformers and switchgear—British firms are already doing some business here, especially those which have established branch factories. In other directions Canada is supplying a fair proportion of her own needs, as in large generators, household appliances (especially vacuum cleaners), electric cookers, insulators, fittings and fixtures, cables, &c.; many transformers, motors, switchboards and switches are also made here.

The official figures of external trade* show, however, that Canada still imports considerable quantities of electrical equipment of various kinds, most of it coming from the United States. The United States has a firm hold on the market for radio apparatus, telephone apparatus and electric light fixtures and appliances. British manufacturers of generators, motors, and switchgear have already made some headway against United States competition, but other fields are practically untouched.

With the exception of telephone apparatus, it is probable that the influence of the Underwriters' Laboratories' standards has been effective in keeping out of Canada a good deal of electrical equipment of United Kingdom manufacture, although other factors have undoubtedly played their part, *e.g.*, the proximity of the United States, and aggresive salesmanship.

Far from Saturation Point

It is well known that, owing to the low rates for electricity prevailing in many parts of Canada, her domestic consumers take far more kilowatt-hours per annum

* See our last issue, p. 945.

The Federal Parliament buildings where the Conference meets

than those of almost any other country in the world. The *Electrical Retailer and Contractor* (a Canadian publication), in a recent issue has, however, shown how far even Canada is from the saturation point with regard to the use of domestic electrical appliances. The following details, taken from this paper, are worth noting :—

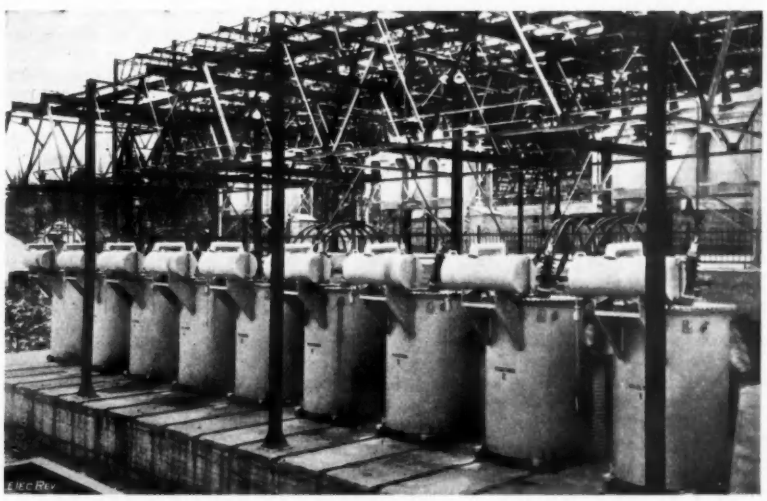
Appliance.	Number sold during 1931	Total no. of homes with	No. of homes without	Saturation per cent.
Clocks	57,000	85,300	1,398,909	5.7
Fans (all kinds)	10,284	180,284	1,303,925	12.1
Fires	10,000	70,000	1,414,209	4.7
Heating pads	—	100,000	1,384,209	6.7
Hot plates and grills ...	60,602	298,763	1,185,446	20.8
Ironers	2,500	30,848	1,453,361	2.1
Irons	170,272	1,398,735	85,474	93.3
Oil burners	4,000	35,000	1,449,209	2.4
Percolators	9,033	122,631	1,361,578	8.2
Ranges	28,849	261,599	1,222,610	17.6
Refrigerators	25,342	109,342	1,374,867	7.9
Sun lamps	5,022	15,126	1,469,083	1.1
Toasters	80,000	597,247	886,962	40.0
Vacuum cleaners	51,569	346,169	1,138,040	23.0
Waffle irons	—	25,000	1,459,209	1.7
Washers	69,778	396,227	1,087,982	26.7

The total population of this great Dominion is not yet 10.5 millions; the total number of houses is approximately 2.3 millions, of which apparently about 65 per cent. are using electricity. In 1930, according to the Dominion Bureau of Statistics, the total number of domestic consumers was 1,317,324, and they took 1,489,575,000 kWh, so that the average annual consumption per domestic consumer was well over 1,100 kWh.

Advancing Domestic Consumption

The average revenue per kWh, in 1930, for domestic service (including farm service, rates for which are necessarily high owing to the scattered nature of the load in farming districts), was 2.29 cents for all Canada. This may be compared with 6.03 cents for the United States for domestic service there; the figures are for energy supplied, not generated, so line losses are excluded. The installed capacity of electric generating plant in Canada is nearly 0.5 h.p. for every person in the country, and the total output, including industrial and commercial, as well as domestic, supply, is about 1,800 kWh per head.

The output of the electric generating stations of Canada has



A large transformer station—West Kootenay Power & Light Co., British Columbia

fallen considerably, of course, owing to present conditions; but it is very clear that the domestic load is much more stable than the industrial and commercial loads. For example, during 1931, while the industrial and commercial loads of the Hydro-Electric Power Commission of Ontario fell off appreciably, the domestic load actually increased considerably. Thus the actual situation, while it is not so favourable as during the previous few years, might have been worse.

It may be of interest to manufacturers at home who are considering the possibility of doing business here to have some idea of the populations and extent of the various provinces; below are given the latest census figures.

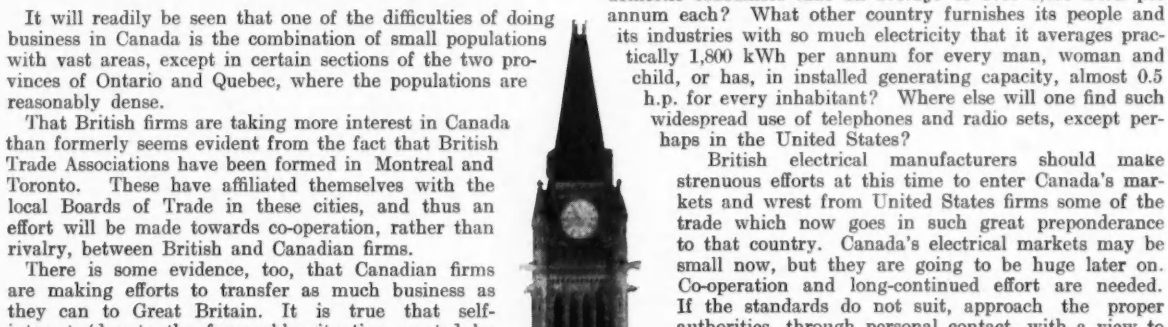
1931 Census

Province.	Population.	Land area (sq. miles).
Prince Edward Island	88,038	2,184
Nova Scotia	512,846	20,743
New Brunswick	408,219	27,910
Quebec	2,874,255	571,004
Ontario	3,431,683	357 962
Manitoba	700,139	224,177
Saskatchewan	921,785	237,975
Alberta	731,605	248,800
British Columbia	694,263	349,970
Yukon	4,230	205,346
North West Territories	7,133	1,258,217
Canada	10,374,196	3,504,638

It will readily be seen that one of the difficulties of doing business in Canada is the combination of small populations with vast areas, except in certain sections of the two provinces of Ontario and Quebec, where the populations are reasonably dense.

That British firms are taking more interest in Canada than formerly seems evident from the fact that British Trade Associations have been formed in Montreal and Toronto. These have affiliated themselves with the local Boards of Trade in these cities, and thus an effort will be made towards co-operation, rather than rivalry, between British and Canadian firms.

There is some evidence, too, that Canadian firms are making efforts to transfer as much business as they can to Great Britain. It is true that self-interest (due to the favourable situation created by the abandonment of the gold standard in Great Britain) has a good deal to do with this movement, yet many Canadians heartily welcome such an opportunity to send orders to England. It is not known to what extent electrical firms are taking part in these moves, but there is no reason to suppose that they lag behind those in other lines of industry.



The Federal Houses of Parliament, Ottawa, by night.

In spite of the fact that Canada still imports, in the way of manufactured products, much more than she exports not only in electrical lines, but also in many others, some of the manufacturers here seem to have the idea that Canada is already largely a manufacturing country.

Reciprocity

This view, perhaps, is understandable, but it rather overlooks the fact that, if Canada is to prosper, she must export grain (which she is so eminently fitted to produce) and other products of the soil. Selling agricultural products to other countries involves reciprocal action in the form of purchases from those countries of products which they, in turn, are better fitted to supply than Canada is to make.

It seems to the writer that as Canada buys electrical equipment from other countries (principally from the United States) to the extent of about twelve times the value that she exports, there should be ample room for some of this trade to be diverted to the United Kingdom while still leaving the Canadian manufacturer a very good market.

It will not do, however, for the British manufacturer to assume that he can effect such a diversion of trade by sending out his standard product. It may be perfectly good—perhaps much better than similar equipment already in use here—but unless it suits the market it will not be a success. The Prince of Wales was right in a recent speech when he said (according to newspaper reports) that " no one will buy from us these days unless we go out to sell to them—sell them what they want to buy." This last hits the nail on the head so far as Canada is concerned.

Probable Future Expansion

In the Imperial Economic Conference lie possibilities for the future of the British Empire, of the greatness of which we of this generation probably have little conception. Canada's area and natural resources are such that she is absolutely certain to play an increasingly important part, for generations to come, in the destinies of that Empire: her present population is small and her present electrical requirements, though large per capita, are small compared with the potential needs of countries having five, ten, or twenty times her population.

Canada probably is more " electrically minded " than any other country. In what other land are over 60 per cent. of the homes using electricity? In how many countries do the domestic consumers take an *average* of over 1,100 kWh per annum each? What other country furnishes its people and its industries with so much electricity that it averages practically 1,800 kWh per annum for every man, woman and child, or has, in installed generating capacity, almost 0.5 h.p. for every inhabitant? Where else will one find such widespread use of telephones and radio sets, except perhaps in the United States?

British electrical manufacturers should make strenuous efforts at this time to enter Canada's markets and wrest from United States firms some of the trade which now goes in such great preponderance to that country. Canada's electrical markets may be small now, but they are going to be huge later on. Co-operation and long-continued effort are needed. If the standards do not suit, approach the proper authorities, through personal contact, with a view to having them modified somewhat so as to make them easier—they cannot be suddenly and radically altered.

If tariffs are such that, in spite of appearances, they work rather to the advantage of foreign countries than of Great Britain, memorialise the Canadian Government, and go on doing it. Make a good showing in the Canadian National Exhibition, not in isolated exhibits but co-operatively and grouped together—not spasmodically, but year after year.

If rules and regulations are such that British equipment is arbitrarily barred out, point out the fact to those responsible for such rules and regulations.

I hope that the Imperial Economic Conference will lead British electrical manufacturers to study the situation more carefully than ever before, especially looking to future possibilities, with a view to making Canadians more familiar with British electrical equipment.

Some co-operative action on a big scale is needed in advertising, in direct sales effort, in the establishment of a central bureau of information and service, and also of branch factories. Apparently, mechanical engineering firms in Great Britain find themselves in very much the same position with regard to Canadian trade as their brothers of the electrical industry. Could they not combine forces to their mutual advantage?

We are indebted to the Canadian Government Motion Picture Bureau for our illustrations.

THE ELECTRICAL CONTRACTORS AT SOUTHPORT

Tuesday this week saw the opening of the seventh annual conference of the Electrical Contractors' Association (Inc.), the N.E.C.T.A., Ltd., and the National Federated Electrical Association at Southport, when about 400 delegates and visitors arrived, most of them in time for the president's reception in the evening. On Wednesday the annual general meeting was held, after which the conference was welcomed by the Mayor of Southport, and Mr. W. R. Rawlings, A.M.I.E.E., gave his presidential address. A paper entitled "Looking Forward" was presented by Mr. H. Marryat, M.I.E.E., in the afternoon, followed by an interesting discussion, and a smoking concert in the evening was a very successful wind-up to a busy day. Thursday's business was opened by Mr. R. Harrison-Watson, M.I.E.E., with a paper on "Installation Problems, Old and New," and after the discussion of this the new president, Mr. W. B. Williams, was installed. Instead of the garden party in the Municipal Gardens which had been arranged for the afternoon a tea-dance was held in the Floral Hall.

A ball and supper, by invitation of the Mayor, concluded the proceedings yesterday evening.

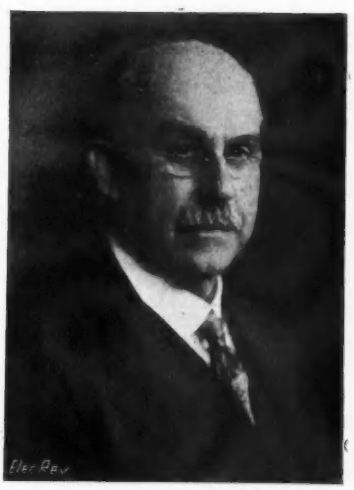
The Presidential Address.

ESSENTIALLY historical and practical, with pointed comparisons with affairs of to-day, "Fifty Years of Electrical Contracting" makes particularly interesting reading. Mr. Rawlings's introduction to electrical work was brought about by the invention by his brother, with whom he was in partnership, of a blow lamp, which led to an introduction to Mr. R. S. Waring, who was in this country from America to exhibit a new l.c. cable. The failure of a Fowler-Waring cable supplied to the late Dr. Ferranti for his h.v. supply from Deptford to London resulted in Ferranti producing his own cable insulated with paper.

Piquancy is added to the record by such references to achievements of the past as the Sax battery which functioned without attention of any kind for over seven years in Somerset House. "Electric bells in those days *were* bells, and we also had a good class of wire insulated with gutta percha." The Phœnix insurance organisation compelled the use of casing and refused to allow l.c. wires to be employed when they first came into existence. Iron tube was also not allowed; but an E.C.A. president-to-be used it all the same.

Wood casing, within its limitations, has proved to be one of the best methods of wiring work, and the development of varied methods of securing earthing continuity raises the query as to whether the rejection of wood casing has greatly improved matters from a protective point of view. No mention is made of the c.t.s. type systems. A set-back was suffered by the industry when it started to advocate the use of electricity for heating, due to electrical men claiming that electric light gave off no heat, resulting in many fires by reason of paper and flimsy material being placed in contact with the lamps. Lack of foresight in providing supply mains has constantly retarded progress, and to-day there are many places requiring supplies which are not available because the authorities are not sure of sufficient income from the first consumers—a policy not consistent with usual business methods.

The president's suggestion of many years ago that the supply, manufacturing and contracting industries should form one central association is well worthy of repetition as a means of solving many problems in these more advanced times. Excepting the cable makers the contractors were the first to form an association, and from it have sprung many other organisations, including the B.E.A.M.A. The E.C.A. was established in 1902 when Mr. Rawlings became the first chairman and the Association became incorporated two years ago. A brief history of the Association is given, and the work of the presidents from then up to the present day is reviewed. There are now 62 E.C.A. branches and 1,500 members. From four watts to one watt or half a watt per candle is a pleasant light progress picture; the President looks forward to filamentless lamps giving four candles per watt.



[*H. J. Whitlock & Sons*

Mr. W. R. Rawlings, President of the E.C.A., 1904-5, 1914-15, and 1931-32

Let it be hoped that those over-enthusiasts for thermal efficiency will not attempt to spoil what is sound policy on the part of the author in predicting that the improvement in electrical heating equipment and its high efficiency will result in domestic water heaters and cookers taking precedence over all other forms of heating service.

Mr. Rawlings again calls for the abolition of meters, in favour of simple current limiters with electricity supplied like water. He contends that already meters are becoming superfluous.

Lord Street, Southport

This address certainly supports Mr. Rawlings's assertion that he is not a pessimist; but his fifty years' experience has led him to the opinion that to ensure safety of the public the Government should make compulsory wiring regulations and prohibit anyone but a member of the E.C.A. or a registered contractor from installing wires or fittings.

He claims to speak from personal knowledge when he says that wherever an accident has occurred, either from shock or fire, it has been the outcome of non-compliance with the I.E.E. Regulations, or because the work has been carried out under incompetent supervision or by half-trained workmen. He therefore calls for Government action in the matter.

The Annual Report

IN his report of the activities of the E.C.A. and Allied Associations during the past year, Mr. W. R. Rawlings denounces the very low prices which are being obtained for installation work. A state of affairs which involves installation work for 5s. per point, excluding switches, ceiling roses, &c., demands the enforcement of a definite code of wiring regulations, or, alternatively, compulsory registration.

On the legal side, representations to the Home Office for alleviation in respect of onerous responsibilities placed upon electrical contractors have met with success, in that a particularly iniquitous clause in the "Building Regulations" has been substantially modified. The Council has taken out a policy to cover all members in the event of third-party claims being levelled against them after the completion of a job, and the cover for any one accident or series of accidents from any one cause is £20,000.

Mr. W. B. Williams, the new President

Amicable negotiations have resulted from the Association's dealings with various municipal authorities; very few of those who obtained powers under the 1926 Act have utilised them in setting up installation departments. The enforcement of compulsory wiring rules, rather than increasing the cost of sound installation work, would promote the standardisation of accessories and thereby assist manufacturers in the reduction of costs by greater mass production.

Referring to the resolution submitted to the annual general meeting last year concerning codifying the law and regulations governing electricity supply in this country, a special committee has been appointed, but it has not yet been able to issue a report for the guidance of members.

Restrictive Conditions

The suggestion that the cost of electrical apparatus or installations is retarding the progress of electricity supply is refuted; rather is it by the simplification of tariffs that progress has been and still further may be made. Reducing the cost of apparatus to the consumer below the economic limit is denounced, as are the irritating obligations which certain supply authorities impose on consumers before they are prepared to give a supply. In a plea for the adequate provision of supply mains it is mentioned that in many cases the supply afforded a consumer is far below that which the consumer is prepared and anxious to take, so that uses of electricity other than for lighting are often restricted.

The Joint Committee of Specialist Associations has been successful in protecting the interests of sub-contractors, particularly in connection with the present R.I.B.A. form of main contract. It has been definitely arranged for negotiations to proceed between the Institute of Builders and sub-contractors with a view to a revision of the standard form of building contract. A new body, the National Federation of Specialists and Sub-Contractors, will undertake this work. In the meantime members should insist on the form recommended by the Joint Committee of Specialist Associations.

Committee "D"

Referring to the work of the N.E.C.T.A., Ltd., hopes entertained by the previous president as to the acceptance of Committee "D's" proposals have not been fully realised. Different interests, upon receipt of the draft, put forward divergent claims for revisions, and the matter is still being debated. Undoubtedly a policy of "give and take" is the only one which will permit the deliberations of Committee "D" to have any tangible effect, and upon this basis an appeal is made to all sections interested to ensure that more than five years' work of a responsible body of men shall not be wasted

"Trading" by concerns which purchase goods on the best possible terms and convey to the private buyer a portion of the discount is condemned as being calculated to rob the legitimate retailer of business which should pass through his hands. Money which should be retained in the industry is going outside. Manufacturers should ensure that the legitimate trader alone secures trade discount.

Mr. H. J. Cash, vice-president

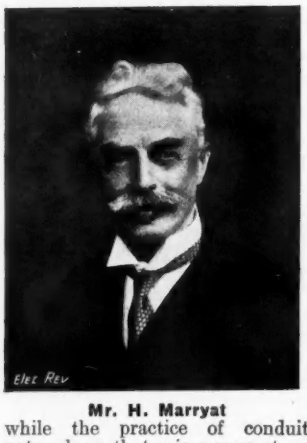
Perhaps the most interesting reference to the work of the National Federated Electrical Association is that negotiations are still proceeding with the Electrical Trades Union: (1) To secure the abolition of the anomalies which exist under the National Standardised Wages Agreement; (2) to secure a national code of working rules to replace the varying conditions which exist at present; and (3) to discuss, and if possible to standardise, conditions relating to apprentices.

It has been decided that the main Committees of the Association shall cease to exist; that the meetings of the Council shall be more frequent; and that the more detailed Association arrangements shall be put into the hands of an executive committee consisting of fifteen members.

It is intended to continue to circulate reports to the branches and sections, and the Council is considering the advisability of issuing a confidential detailed report at frequent intervals to keep all members fully informed of the Council's activities.

Looking Forward. By H. Marryat, M.I.E.E.

THAT the Electrical Contractors' Association is no exception to the rule that every industry depends upon the national position fully justifies the author's lengthy survey of national and world affairs. Summarised, his remedy appears to be to spend on essentials rather than on non-essentials generally. In the immediate future we have to face the loss of markets with attendant hard times and keen competition, relieved by a rapidly increasing succession of inventions, industrial changes, &c.



Mr. H. Marryat

These all provide opportunities for the contractor; he can, for instance, look forward to lamps of the present type but of higher efficiency, and then to a filamentless lamp of still higher efficiency, and finally to tubular lighting. Another reasonable anticipation is the non-insulated return system of wiring, while the practice of conduiting new buildings in a network so that wires may at any time be drawn in to any point upon any floor is already gaining ground. The contractor must study these systems carefully, so that conduit work shall not pass to the builder. There is also the possibility in this or the next generation of a reversion to a d.c. distribution system.

Distribution of goods by manufacturers, wholesalers, retailers, and the supply industry is condemned. Prices to the consumer must be inflated to cover overhead costs, and common sense dictates co-operation. The Association's policy should be to sell to the public with the lowest margin of price compatible with covering reasonable standing charges and a living profit.

The author would make it an offence against the trade for any member knowingly to accept work without profit. Competition is rather a question of determining how much may be spent upon selling goods than of cutting retail prices. No retailer who is unable to make a living upon these lines has anything to complain about when he loses an order, beyond admitting that the other is the better man.

Sales by Supply Authorities

Mr. Marryat has strong views on the question of the selling or renting of appliances by supply undertakings at cost price or less in order to further the sales of electricity. He quotes Section 48 of the 1926 Act, and points to a serious "snag." It is obviously not easy when a supply authority sells an installation complete to ensure that retail prices have been obtained for all the material and that full standing charges have been debited. Reference to the form of accounts evolved by the Institution of Municipal Treasurers and Accountants, with the approval of the I.M.E.A., reveals such clauses as "such over-

head charges as the authority may deem reasonable and possibly a sum to provide for maintenance during the period of hire-purchase."

Combination Urged

The strong point is made that retailing and contracting are not a part of the same thing. The shop and showroom represent one business and installation work another. Within the limit of economical management combination of contracting concerns is advocated. A system is cited in which each individual contractor retains his own customers, solicits and obtains his own orders, supervises his own work, and takes his own profit on his own business. But a general manager runs the accounts, finance, estimating, buying, &c., the resources of which are available to each member. The expenses for these are common to all the members. Such a concern may be run upon a larger scale than is practicable for an ordinary partnership, and is far more flexible and satisfactory in its allocation of profits.

Loading the Grid

The spectacular instance of electrical rationalisation in this country is the grid. It has cost about £32,000,000, and the total outlay visualised in the Weir report is £250,000,000. The rationalisation for this creation will be extended to its loading, for which there must be very extensive propaganda and salesmanship. And the people who do the canvassing will do the contracting.

It is urged that contractors should shoulder a larger share of the cost of E.D.A. propaganda, in return for which they may receive a bigger voice in the management of the Association or choice of propaganda. The work of E.D.A. is not intended to replace individual effort, but no amount of scattered effort can stimulate general demand so effectively as co-operative publicity.

Installation Problems Old and New. By R. Harrison-Watson, M.I.E.E.

BRIEFLY summarised, this paper represents a comprehensive list of "snags" in regulations governing installation work and of wiring accessories, etc., which can innocently be misinterpreted or misused, so defeating their objects.

In a case of injury from the use of an electric hair dryer, the three-pin plug had been connected to the three-core flexible so that the s.p. switch on the dryer was on the return lead. Had the machine obtained its supply *via* a two-pin plug, or any non-standard reversible three-pin plug, there would have been no obvious means of ensuring that the switch was on any one lead. Do reversible three-pin plugs possess any advantage over the British Standard three-pin plug, especially now that interlocking can be secured without slotting the third pin? Manufacturers are asked why they cannot mark the live sides of the socket outlets, and the suggestion is made that the left side should always be the live one, because of the "grip" in the phrase "left—live."

The President's reception: Mr. W. R. Rawlings, accompanied by Mrs. Rawlings and Mr. W. B. Williams, greeting Mrs. Tweedy-Smith

Awkward Wiring and Earthing

It is difficult for a contractor to make an adequate charge for renewing the flexible wire feeding a vacuum cleaner, work which seems so simple to the public. Why not, therefore, have a socket connection on the handle of the cleaner, similar to that on the usual flat iron? In the event of a consumer being killed as a consequence of using an "earthed" kettle on an unearthed outlet by reason of the use of one of the available adaptors for converting an earthed three-pin outlet into a two-pin non-earthed outlet, in a bedroom with a hot-water radiator, plumbed wash basin or metal fire place, who would be liable?

What is the use of a regulation limiting the number of outlets on a given circuit if accessories are available from first-class manufacturers whereby the number of fixed outlets on a circuit may be multiplied by three, quickly and inexpensively. If by a one-to-three adaptor a 15-A circuit is loaded to 45 A, is anybody liable?

In supporting the accusation that British engineering practice has rather overdone the "solid and substantial" ideal in connection with plugs, the author suggests that far more difficulties are experienced as the result of heating at the switch contacts than from defects in the associated plugs. The I.E.E. Wiring Regulations permit the use of a fused adaptor as a *reducer*. But the fixed adaptor can now be a 15-A plug providing, in addition, a 5-A fused outlet on top; and into this secondary 5-A outlet can be inserted yet another adaptor with two or three further outlets.

A plug in normal use represents a very efficient type of circuit breaker, and in view of the different arc-quenching devices now on the market, it is doubtful whether switch control of sockets is really necessary. If an accessory is safe in normal use, why attempt to guard against wilful abuse. It is asked, what progress, if any, is being made in connection with the leak-trip system of protection.

Mr. R. Harrison-Watson

Wiring Systems

There is a hint that many of the wiring systems now on the market are not really effective as regards earthing. The author doubts whether the "bits and pieces" of many systems make for such a satisfactory earthing job as the screwed-barrel system. With regard to tough-rubber-insulated systems, Mr. Harrison-Watson would like to see incorporated in such cable a third (earth) wire as a matter of course. Despite the fact that both earthed-metal switches and all-insulated switches are theoretically shock-proof, the regulations require only the earthed-metal switch to be fixed out of reach of the bath in a bath-room. Ceiling switches with insulated cords should be in more common use.

It is suggested that the answer to the query as to whether the capacity of the main switch governing a distribution board for domestic heating should equal the aggregate capacity of all the sub-circuits is to be found in I.E.E. Regulation 74—"when the conductors are carrying the maximum demand under practical conditions of service."

Regulation 67J, which requires that "in places where petrol-driven conveyances are stored or repaired, switches shall be placed not less than six ft. above the floor level," leads the author to point out that flexible leads are used in garages for portable drills on the floors or in the pits. Surely there is more risk of igniting petrol gas by the portable appliances than by switch or plug action.

At the reception: Mr. F. J. Hawkins, Mrs. Kennedy, Mr. N. Aish, Miss J. Taylor, Mr. R. Robson, Miss M. Taylor, Mr. C. B. Taylor, Mrs. Hawkins, Mrs. Robson and Mrs. Taylor

Britain's Electrical Future. By "Forty Years"

Electricity supply: some controversial points

DURING the past year the ELECTRICAL REVIEW has consistently urged the necessity for everybody connected with the practical side of the electricity supply industry to be wide awake. Every week or so I have noticed that writers have been expressing their views regarding methods which should, or might, be employed to so bring the advantages of electrical service before the general public and the various industries that consumption would grow at a greater pace. It seems to be generally recognised that it is only by the pursuance of a "forward policy" everywhere that the output under the national grid scheme can reach such a point that the maximum possible advantage will ensue for the great majority of the people of Great Britain within a reasonable period.

Almost astounding statistics have been produced showing what a large proportion of our population is, for one reason or another, not using electricity, and statements are constantly being advanced regarding the very limited use that is made of it by the consumer who is already on the mains. A very enterprising and active gas competition in some places retains the business of large numbers of people who have been using gas "from their youth up" and are disinclined to change without very good reason. This attitude will not last among the younger generation if electric cooking and water heating and domestic power appliances make substantial headway in reliability, efficiency, cleanliness, labour-saving and cost.

What the Gas People Think

With some of the older generation the gas habit will persist though some of the happiest electricity-using people in the land have reached the seventies or the eighties. Taking it as a whole, however, it is reasonable to suppose that given free competition between the two agents electricity will be easily able to win over hundreds of thousands of gas users providing distribution and service facilities are available assuring them that they can have it with a minimum of trouble.

An interesting situation seems likely to develop as the national electrical policy which must consistently follow the completion of the grid comes more actively into evidence, because the gas interests, which raised their voice in protest against the policy in Parliament, will not sit down quiescently if they consider themselves to be placed in an unfair position with the weight of the Government, as represented by the Ministry of Transport, the Electricity Commissioners, and the Central Board, thrown into the scales against them.

This point need not make electrical men seriously anxious, but the position is interesting in its possibilities. You may convince a gas man that electricity is infinitely better for all sorts of purposes if you are very clever, and you may convince some people of the inevitability of the law of the survival of the fittest; but that leaves the plain fact just the same that national electricity supply is to be pushed by a Government authority while a competitor—another section of the nation, let us admit—is in the field. This leads us to one of the main considerations from the public point of view.

Public or Private Ownership?

The electrical purpose from above seems to be to impose the national legislative will upon all authorities whether they are municipalities, electricity supply companies with comparatively small areas, or big power companies. How can this be carried out in practice? Surely we have a long row to hoe before it is possible! The problem becomes infinitely more complex with part of the business in the hands of public ownership and part in the hands of private enterprise.

If we contend that local authorities should not engage in electricity supply and kindred activity because it is a form of trading, we merely show that we are living in the far back period of primitive electrical controversy. Yet is it not the fact that recent experiences have shown that when it is essential that electrical development should be pushed forward for all that it is worth the local parochial policy has stood in the way? Is it not also more apparent than it ever was that we ought not to permit local boundaries to delimit electrical expansion?

Municipalities are so constituted that they cannot reach out to unserved areas beyond their own limited legislatively enacted spheres. It is, of course, unthinkable that municipalities should assume control of power companies. Is it quite as unthinkable that municipal undertakings should some day become part of big private enterprises? Or is generous-minded co-operation, under Government encouragement, between both public and private enterprise, as a consistent national policy from end to end of the land, likely to prove the better course? One may even be driven in one's thought as one proceeds along these lines to wonder whether anything short of complete private ownership or complete national ownership and control will ever give everybody a chance of reaping the full benefits that are obtainable from an electricity service.

Should Municipalities Sell Out?

In economic discussions that have been taking place of late our legislators and other public men have been urging economy in local expenditure, but *not* economy in expenditure by privately owned power companies. One is tempted to hazard a suggestion that the local authorities would be both relieving themselves of existing capital indebtedness and future capital obligations, and allowing electrical expansion business to develop upon enterprising trading lines, if they disposed of their undertakings to big companies. These companies with the approval of the Government would experience no difficulty in raising funds—there is so much money awaiting investment, and electrical securities, especially those of the Central Board, the power companies and important electricity supply companies, are in such high favour that some of them are reported by the Stock Exchange to be practically unpurchasable excepting in very small parcels unless a deceased estate has to be realised.

Recent issues of stock by the Central Electricity Board may be quoted as proof of the eagerness of the public to put their money down for such securities. The £10,000,000 4½ per cent. stock issued at 96 was quickly oversubscribed, and already stands at a substantial premium, while the £7,000,000 5 per cent. stock issued earlier in the year at 95, though left as to a considerable part of it with the underwriters for a moment or two, very soon found its way to the investor and soared to 104-105. The low issue price and the temporary lack of public support were due to the special 6 per cent. bank rate of the early months of the year.

Co-ordinated generation is one thing and co-ordination of distribution quite another as things are to-day. How can co-ordinated distribution be obtained with a progressive policy everywhere, or with a uniform system of charging a national low price, with an income or profit on the capital expended, so long as we have some of our undertakings owned by municipalities and some by companies? Which is more likely to be operated efficiently—which is more likely to have efficient management and to develop at a more rapid rate—the municipality which is managed by a committee consisting of men who may know nothing about electricity and are retiring at certain or uncertain intervals with fluctuating effect upon policy if there be one, or the company controlled by a board of directors, some of whom it is true may know no more about electricity than does the average committee-man, but who are more concerned with finance and dividends than with progressive policy which may not always mean immediate profits?

Both forms of ownership, of course, have these defects—where is the perfect organisation in this world?—but there is experience, and there are results, by which we ought to be able to judge which is better. The committee-man is a locally elected councillor who has found a place on the council for any old reason, not because he is a business man or an electrical man. He is in danger of being influenced by local feelings and politics; this as a factor in deciding the policy of a department responsible for the technical and business development of electricity is altogether ludicrous.

A Broader View Necessary

Does it not appear that an electrical policy for the whole of the Kingdom requires the sweeping away of local control by little bodies with, in many places one is afraid, no electrical policy ever properly thought out? They have their engineers and their undertakings, but how much thought is ever given to their relation to the electrical position of the nation as a whole? Where is the incentive to make progress if they merely exist to keep running for the sake of giving supply to anybody who chooses to apply for it?

When we are told that the Central Board intends to do this, or that, if something else does not happen, what are we to understand? Would it not be better that we should know exactly where we stand, or at any rate whither we are thought to be tending? Assuming the policy of the nation, as represented by the grid, to be one of electricity for everybody at an economic price and that there are authorities who by their constitution, or lethargy, or obstructiveness, stand in the way of the attainment of such an end at an early date, what are we, or what is the Minister of Transport, going to do about it?

Much has been written about the lines along which electricity supply business should be developed commercially, but it is obvious that not everybody who might be doing good work in that connection is contributing his share of effort. The

local undertaking may be considered a success from the local point of view, and efforts to do bigger things may appear to be unnecessary. Yet if the object of the undertaking is to serve everybody, or to induce everybody to use electricity, there will be such an addition to the load that the grid will be filled at an earlier stage than otherwise, and rural electrification, electro-farming, and other things calculated to help our national well-being will assist us as an entire people. Is that a legitimate aim—to make our land more self-supporting, to help our industries to operate more efficiently and to provide more work for the multitude now helplessly idle and living on assistance derived from the incomes of those fortunate enough to be in employment?

Decision or Drift?

If these things really are a desideratum for securing the future well-being of forty or fifty million people should we drift along, or should we not rather take a short cut to bring it about? I know that I am on very controversial ground, but that is inevitable if one is really unbiased and conscientious about this matter. I do not mind controversy if as the result of it we can only find the way out of our present dilemma. Some of us shudder at the thought of nationalisation because we haven't been impressed with the effects of Government control—it is liable to be as open to the charge of lethargy as any other form of control, perhaps more so. We may like private enterprise because we are connected with it; on the other hand we are better able to judge of its evils because of that connection. Some of us shudder at the risk that private ownership may lead to disregard of the interests of the consumer in some way, shareholders' interests coming first, but others of us have seen that the well-managed business with a broad mind and an enterprising policy can do well for consumer and shareholder alike.

Some men who earn their living by the sweat of their brow municipally, expatiate upon the littleness of the municipal mind and wish that they could get out of such employment, preferring a private management to a poor municipal committee mismanagement. How can we combine the benefits derivable from all the different classes of control?

Did not the statement made by Sir Andrew Duncan at the I.M.E.A. indicate a very promising way of reaching a solution of our problem? The preliminary move outlined is the bringing together of those whose interests are diverse and likely to come into collision; a measure of attempted co-operation between those respectively interested in selected and non-selected stations; an electricity supply committee representative of all interests (company and municipal alike) to take counsel together under official auspices; yes, even an I.M.E.A. relinquishing its *municipal* characteristics or circumscribed interests and joining hands with all company undertakings, eliminating the local spirit and substituting one which will enable electricity supply to progress unhindered—to have free course to win its way on sheer merit of valuable service.

It may be that my anxiety with regard to the future is not warranted and that things will all come right in the end. I hope, however, that the foregoing rambling thoughts, expressed by one without an axe to grind, may be of some service in stimulating that full and free discussion which lengthy observation and some knowledge of the hampering effects of self-interest suggest to my mind as very necessary. If we persist in letting sectional interests control the development of electricity supply—well, let it rest there at the moment!

A Heat-storage Cooker

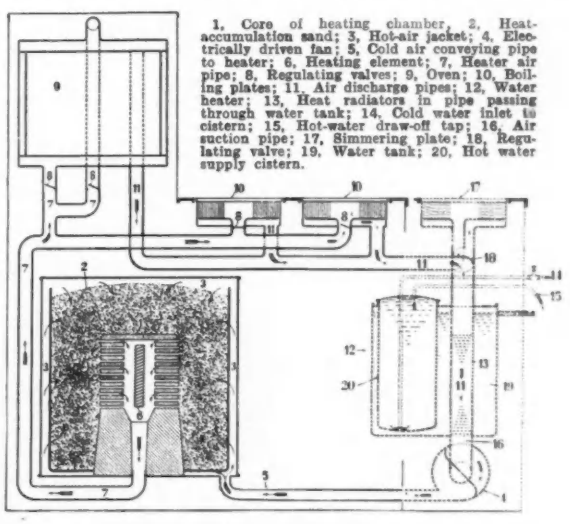
IN collaboration with M. Seehaus, the Société de la Fabrique Therma d'Appareils de Chauffage Electrique, Schwanden, Switzerland, one of the largest manufacturers of electric cooking stoves on the Continent, has recently introduced a new type of cooker incorporating a heat-storage arrangement. The new stove, instead of using direct heating elements, comprises an oven and three boiling plates which are heated by air which has been passed through an electric heater by means of a small electrically driven fan.

The diagram of the stove shows that it comprises an oven (9), and three boiling plates (10) and (17), which are made of light non-rusting alloy, and are 8.6 in. in diameter. The heat accumulator consists of heating elements (6) embedded in sand arranged to give four degrees of heat, ordinarily requiring respectively 470, 515, 565, and 660 W. Full load is put on when it is desired to heat up the stove quickly, or for either momentary or continuous heavy cooking. Hot air is supplied directly to the oven and the two front boiling plates, and from these it passes to the rear plate, which is intended to serve only for simmering purposes, and finally to the water heater. If the simmerer is not required, the air can be passed directly to the water heater by a control valve (18).

A standard model

The water supply is heated indirectly; that is to say, the small cistern (12) from which the supply is drawn is heated by being immersed in an open tank, the water in which is hot-air heated. The small cistern is connected with a source of water, so that any hot water drawn off is replaced by cold. The open tank has to be occasionally replenished by hand in order to make up for loss by evaporation.

The makers state that, starting from all cold, the stove can be completely heated up in from 18 to 20 hours when full power is applied, and that small quantities of food can be cooked after five or six hours. A device is provided to cut out the heating elements automatically when the stove has been under power for some time, with the oven or plates not in use, the elements being again automatically switched on when the temperature falls below a predetermined minimum.



1, Core of heating chamber, 2, Heat-accumulation sand; 3, Hot-air jacket; 4, Electrically driven fan; 5, Cold air conveying pipe to heater; 6, Heating element; 7, Heater air pipe; 8, Regulating valves; 9, Oven; 10, Boiling plates; 11, Air discharge pipes; 12, Water heater; 13, Heat radiators in pipe passing through water tank; 14, Cold water inlet to cistern; 15, Hot-water draw-off tap; 16, Air suction pipe; 17, Simmering plate; 18, Regulating valve; 19, Water tank; 20, Hot water supply cistern.

Arrangement of the Therma-Seehaus cooker

The stove illustrated is capable of catering for from six to eight persons, but a larger number can be provided for by switching on full power. The dimensions of the standard oven are approximately 19¼ in. wide by 9½ in. high by 17¾ in. from back to front. The hot air is circulated about the top and bottom of the oven by separately controllable pipes, while in order quickly to heat up the oven means are provided for rapidly passing hot air through its interior.

Among the chief claims made for the new appliance is that the heat in the oven and that of the plates can be progressively regulated, instead of the usual limited range of fixed degrees of temperature, and that where power is only supplied at low rates at night or other inconvenient hours of the day, the stove can be heated up during that time, and the cooking of food carried out at any time desired up to six hours of switching off.

Star-star Transformers. By A. M. Perry, B.Sc.(Eng.)

Their behaviour on open circuit

A TRANSFORMER with the secondary winding on open circuit, having normal pressure applied to the primary winding, will take a current from the supply mains equal to the vectorial sum of the magnetising current and that required to supply the open-circuit losses due to hysteresis and eddy currents in the core, core clamping devices, tank and other metal situated in the stray magnetic field, and to the resistance of the winding. Losses in the insulation may be neglected.

The true magnetising current, approximately 90 deg. out of phase with the supply voltage, is far in excess of the current

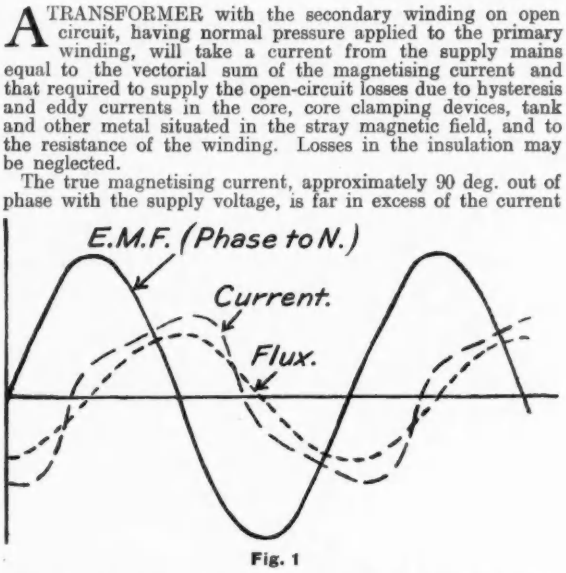


Fig. 1

supplying the iron loss which is generally in phase with the voltage; the power factor on open circuit will consequently be very low.

Star Point Connection

The star point on the primary side is usually either earthed solidly or connected to a fourth wire. In the former case it will be assumed that the transformer is in parallel with other plant with earthed neutral points.

If the transformer is on open circuit and a three-phase voltage is applied (sine-shaped between the lines and star point) the current taken may be only 5 to 10 per cent. of full-load current; so that the resistance drop in the windings will be small and the applied voltage will be approximately equal and opposite to the induced back e.m.f., which will also be sine-shaped. But the back e.m.f. is proportional to the rate of change of flux in the core threading the windings, and, since the rate of change of a sine wave is a cosine wave, in order to produce a sine-shaped back e.m.f. to balance a sine-shaped applied voltage we must have, neglecting magnetic leakage, a sine-shaped flux wave in the transformer limbs approximately in quadrature with the voltage.

Owing to hysteresis and variation in the permeability of the iron with flux density the shape of the no-load current wave will differ from that of the flux wave produced by its wattless component, the difference being greater with higher flux densities in the active iron in the core. Under these conditions saturation is approached; the value at which this occurs depending upon the grade of iron employed.

Since the flux wave must be sine-shaped, the magnetising current cannot in general be sine-shaped. The current will increase more rapidly than for a sine wave as the flux density increases and the saturation point is approached, giving the peaky magnetising current wave form, which contains a harmonic of triple-fundamental frequency and others of probably lesser amplitude and of higher frequency.

Value of Harmonics

The value of these harmonics will depend upon the degree of saturation of the iron at the instant when the value of the flux density reaches its maximum; this can be controlled by design and choice of material for the core. The current wave will not be truly symmetrical, since, due to hysteresis, with decreasing flux density a smaller magnetising current will produce a certain flux; there will also be some residual magnetism when the current is passing through zero value, which will displace the current curve in relation to the flux curve, causing the latter to lag slightly.

Fig. 1 shows in an exaggerated form the shape and relationship of the generated e.m.f. (phase to neutral) flux per limb, and magnetising current wave under these conditions. The current harmonics are independent of the supply. With high flux densities their amplitudes may become appreciable and generally they cannot be completely eliminated.

As the magnetising current in each phase contains a third harmonic we shall have, at the junction of the windings, the three fundamentals of this current (the algebraic sum of which will be zero, since they differ in phase by 120 deg.) and three sets of third harmonics. Now the sum of these third-harmonic currents will flow in the line joining the star points in the case of the four-wire three-phase system or in the earth path itself in the three-wire earthed neutral system.

With balanced conditions the triple-frequency current in the neutral wire will be three times the value of the triple frequency current per phase; it will also be approximately sine-shaped. If these harmonic currents in the windings become heavy they may cause an appreciable increase in copper loss.

Again, the current in the fourth wire may cause inductive interference in near-by telephone or relay circuits if the two lines run parallel to one another for any considerable distance without transposition. Owing to magnetic leakage these triple-frequency currents will produce triple-frequency fluxes in their respective limbs, which like the currents will be in phase with each other.

The return path for this flux must be through the air or any iron work near the winding itself, but not the core, unless it is of the five-limb construction. These harmonic fluxes may cause a considerable increase in the iron loss. The reluctance of this air path being considerable, the triple-frequency component of the magnetising current will increase cumulatively. If a transformer running on a three-phase four-wire system has the star point connection broken, the no-load current will be decreased appreciably in some cases.

Insulated Star Point

When the transformer has the neutral point completely insulated, by Kirchhoff's Law the algebraic sum of the instantaneous value of the current in each phase coming together at the star point must be zero; the three balanced currents must be sine-shaped, with a difference of phase relationship of 120 deg. Thus the magnetising current must now be sine-shaped. A sine-shaped magnetising current will not produce, as with the four-wire system, a sine-shaped flux distribution in the core. Neither will the generated e.m.f. per phase be sine-shaped (even if the line voltage is) nor even of the same form as the flux wave, since the induced e.m.f. is proportional to the rate of change of the flux and not to the actual value of the flux.

A sine-shaped magnetising current wave will, with increasing current, balance a flux that will tend to lag behind the current. Owing to hysteresis and non-uniform permeability the flux density will be less in proportion to the current at the higher values (*i.e.*, at the peak of the magnetising current wave when saturation is approached). This will give a flat-topped wave, slightly steeper on the side with increasing current. Now as the generated voltage will be proportional to the slope of this flux wave it will have a prominent peak when the value of the flux drops rapidly towards zero, as shown in fig. 2.

Effects of the Harmonics

From the fundamental expression for the generated e.m.f. in a transformer, viz., $E = 4kfTB_{max}A.10^{-8}$ volts (where k is the form factor of the e.m.f. wave, f the supply frequency, T the number of primary turns, B_{max} the maximum value of the flux density in the core, and A the cross sectional area of the iron in the core) it follows that the product of the form factor and the maximum flux density must be constant, assuming the other terms to be constant.

The iron loss for a transformer is normally calculated as that for a sine wave of applied voltage at a specified pressure, and any departure from this condition will modify this value. For a sine wave, $k = 1.11$; but for a peaky wave such as the

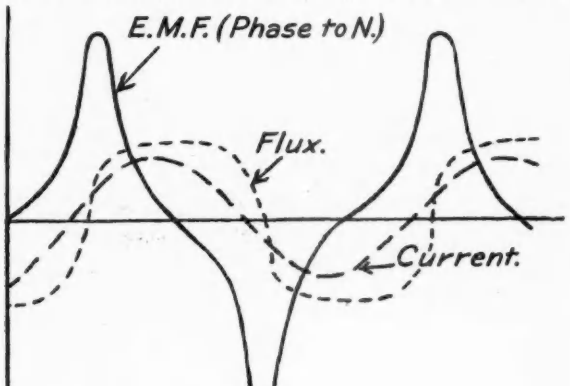


Fig. 2

pressure wave across each phase under the conditions assumed k will be greater than 1.11 and thus the maximum flux density will be less than with a sine-shaped pressure wave. A lower flux density will mean a lower iron loss since the hysteresis loss is approximately proportional to $B_{max}^{1.6}$. In high voltage transformers the advantage of the lower iron loss with peaky waves is off-set by the maximum value exceeding that with a pure sine wave, with a possibility of insulation troubles.

In all the cases considered above the variation from sine-wave conditions is dependent upon design, more especially upon the relation between the maximum flux density reached and the constants for the iron in the magnetic circuit. In practice with low flux densities the difference in conditions should be negligible, unless the transformer is operating at more than the proper voltage.

With delta-connected secondary windings the conditions will be modified since third harmonic currents in phase with one another can circulate round the mesh.

The National Physical Laboratory

THE annual inspection of the National Physical Laboratory by the General Board took place on June 28th. Sir F. Gowland Hopkins, President of the Royal Society and chairman of the Board, Sir Richard Glazebrook, chairman of the Executive Committee, and Sir Joseph E. Petavel, director of the Laboratory, received visitors in the high-voltage laboratory where one-million-volt spark demonstrations were given.

Tea was served in the aerodynamics building where last year stream-line flow in air was rendered visible by means of the shadows of bands of hot air produced by fine wires heated electrically. This method has now been further developed by using an interrupted spark instead of the steadily heated wire, so that the image obtained consists of a series of " dots " of heated air in place of a continuous trail. Stroboscopic methods make it possible to follow the motion of any chosen " dot."

When reviewing the annual report in our May 6th issue (p. 667), the increasing extent to which electrical methods are being used to enable non-electrical tests to be made was commented upon. A striking example of this is the new compressed-air wind tunnel, whose compressors and air circulator are driven by motors aggregating 1,600 h.p. The model aircraft inside is motor and electro-magnetically controlled and the forces acting thereon are measured externally.

For testing high-pitch airscrews an interesting three-phase motor has been designed and made at the Laboratory. Although it is only 9 in. in diameter, it will produce 12 b.h.p. at 3,000 r.p.m. for long periods and up to 20 h.p. for a short time. Gearboxes have been constructed to enable six separate airscrews on a model to be driven by one central motor in the fuselage. The geared shafting is so designed that it can be fitted fairly easily into models of different types.

Testing Metal Coating

The resistance to wear of deposited metal coatings, such as chromium plate, is largely related to its hardness, but as such deposits are often less than one thousandth of an inch thick it has hitherto been impracticable to measure their hardness accurately. A refinement of an existing method now enables the Engineering Department to test thin coatings easily by gauging microscopically the size of an impression made by a diamond point.

In testing vibration-insulating materials transmission through the specimen is measured at various frequencies with the aid of a gramophone pick-up and valve amplifier. The electric arc welding of joints of steel-framed buildings is to be investigated by systematic tests of the work of a large number of welders; the forms of test piece which have been adopted were exhibited and the method by which the tests will be made were explained.

Certain impurities in the feed water have been blamed for the peculiar form of corrosive attack which is believed to be the cause of cracks in high-temperature steel parts of steam boilers. Experiments are to be conducted in the Metallurgy Department to determine how such cracks are formed. Small specimens of typical boiler plate steel will be tested under tension inside a seamless pressure cylinder which will be heated electrically. Sufficient liquid will be placed inside the bomb to cover the specimens under test and the heat will be so regulated that desired steam pressures up to 500 lb. per sq. in. may be attained. With this equipment it will be possible to study at high temperature and pressures the influence of different solutions on stressed steel specimens.

To help to investigate the resistance to corrosion by superheated steam materials, a new type of boiler has been devised. Although its steam output is exceedingly small, a pressure of 1,000 lb. per sq. in. can be reached at the high temperature of 600 deg. C., the pressure being maintained automatically at the required value. The steam is produced by pumping water through a long coiled tube of special stainless steel which is heated electrically. The steam is passed into a vessel of stainless steel, also heated electrically, which contains the specimens of metal under test.

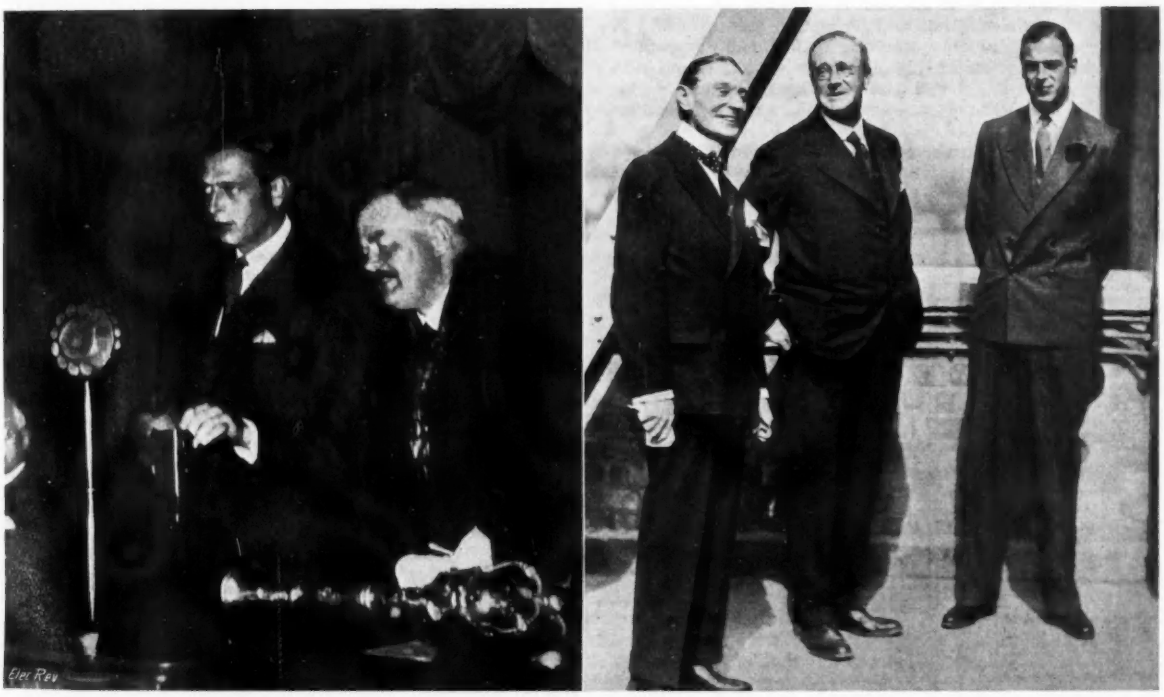
A Wire-measuring Instrument

An instrument has recently been constructed in the Metrology Department for measuring the thickness of very fine wire such as is used in electric lamps and wireless valves. This wire is only about one-thousandth of an inch in diameter, and an accurate knowledge of its size is required before it can be used. The instrument is a combination of a mechanical and an optical lever, so arranged as to give a final magnification of about 15,000 times. It enables the diameter of a wire to be measured to an accuracy of a few millionths of an inch, and will also reveal variations in the diameter from place to place even as small as one millionth of an inch.

It is possible to maintain elastic vibrations continuously, with an extremely constant vibration frequency, if proper precautions are taken to control the temperature closely. In the N.P.L. vibration clock the longitudinal vibrations of a metal bar held at its centre are utilised to provide a " pendulum," oscillating about 2,367 times per second. The " pendulum " is then linked electrically to counting mechanism, the other essential part of any clock, by using an amplified current generated by the motion of the bar to drive a phonic motor synchronously. One spindle of the clock train driven by this motor rotates once per second, thus providing a source of time in convenient units. For high precision measurements seconds signals can be taken off with great accuracy and can be transmitted to a special chronograph by which time observations can be made to within one five-thousandth of a second.

Apart from the Laboratory's well-known work in medical radiology, its use of X-rays for the elucidation of the crystal structure of materials is of considerable industrial importance. The Optics Division is busy with colorimetry and infra-red spectrometer design. Measurement of these heat wave lengths is extremely difficult because after the radiation has been purified it is so faint as to involve the detection of a rise in temperature of not more than a millionth of a degree, and this is done with the aid of minute electric currents.

In the Electricity Department photographic equipment is available for studying the details of fuse performance under severe conditions of " blowing." Insulators can be tested at over a million volts, and many radio investigations are in hand, while the Photometry Division is investigating street lighting, vehicle head lamps, traffic control signals, daylight lamps and fittings, and photo-electric cells, while the characteristics of " glare " are being studied with a view to evolving means of measuring its effects.



(Left): Prince George starting up the new turbo-alternator set at Hackney; with him is the Mayor of the borough. (Right): Messrs. J. R. J. Bowden (deputy electrical engineer) and Mr. L. L. Robinson (borough electrical engineer) photographed with the Prince. (*See page* 30.)

Primary Battery Improvements. By A. Mortimer Codd, F.Ph.S.

Ammonium persulphate as a depolariser

WHEN employing primary wet cells for protracted open circuit work it is frequently more important that the cell should be chemically inert over long periods than that it should be electrically powerful. For example, the cells used for bell ringing in an ordinary residence are probably not called upon to furnish more than 2 or 3 Ah per annum, yet, although the chemical energy originally put up in the cells is sufficient to supply several times this amount, the probability is that the cell will be out of action at the end of twelve months or two years; this is due not to lack of chemical energy, but because the electrolyte has evaporated, or is choked by coraline growths, or because the terminals have become corroded, eaten away, or otherwise rendered non-conducting by the creeping of the salts used in, or by gases emitted from, the cell itself.

Therefore a relatively weaker cell that will remain in action indefinitely is better suited to such work than a stronger cell which is liable to local action or corrosion of its terminals, and it is such a cell that I set out to devise, the particular circuit in mind being that used to operate a number of electric clocks. Such a circuit I believe to be a most stringent test, because not only is there a regular drain on the cells, but also the discharge must be efficiently supplied for many months on end without any symptoms of failure.

Experiments with Electrolytes

In casting about for such a cell I was much impressed by some former experiments made on the Schanschieff cell, which uses mercury sulphate as electrolyte. The chief difficulty experienced was to render the mercuric sulphate soluble in water, and to this end I tried various salts as vehicles, the best being notably ammonium persulphate.

With a simple element of this description an e.m.f. of 1.75 V was readily obtainable, together with really powerful currents for a short period, the difficulties being the deposition of mercury upon the zinc and the intense heat generated, which threatened to crack the glass vessel used and melted the paraffin wax protecting the lead carbon-caps.

Since these experiments some seven years ago I had developed the ferric-chloride type of Codd cell,* which is, however, not entirely suitable for long open circuit work, and it seemed worth experimenting with the mercuric sulphate-ammonium persulphate mixture as a substitute for the ferric chloride.

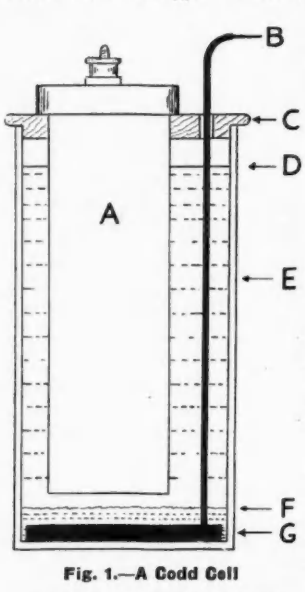


Fig. 1.—A Codd Cell

(A) Carbon; (B) rubber covered wire; (C) lid; (D) level of electrolyte; (E) glass jar; (F) sediment; and (G) zinc.

A cell of this type, fig. 1, was therefore set up and gave remarkably encouraging results. It soon became clear that the discharge was due almost entirely to the ammonium persulphate and that the mercuric sulphate could be dispensed with without materially decreasing the ampere-hour capacity of the cell.

I met the difficulty, however, that any attempt at increasing the Ah capacity of the cell by using a stronger electrolyte resulted in increased internal resistance and the formation of crystals on the zinc, these varying from quite small sand-like crystals to others an inch or more across, frequently rendering the cell entirely non-conducting.

How the Cell Works

The action of the cell is as follows. The solution of ammonium persulphate acts as both excitant and depolariser, the ammonium sulphate acting as the first and the atoms of oxygen as the second. The ammonium sulphate combines with the zinc to form zinc ammonium sulphate, which, being of greater specific gravity than the main electrolyte, lies at the bottom of the cell on the zinc as a syrup.

Zinc ammonium sulphate is both a poor conductor and sparingly soluble, and therefore tends to crystallise out freely, when a dense solution or syrup forms. It is not at first readily detectable, but may be seen when the carbons are gently agitated as faint hairlike threads at the bottom of the cell. If specific gravity beads, such as are used in accumulators, are dropped into the cell they will float near the bottom on the syrup, varying in height according to the state of discharge of the cell and therefore according to the density of the syrup.

Although this syrup may on protracted discharge tend to become non-conducting and therefore raise the internal resistance of the cell, it has also the valuable property of protecting the zinc on open circuit from local action, and this may be enhanced by the further addition to the solution of a small quantity of powdered glass, sand, pumice, or the like, to act as a mobile porous pot, affording a resting place for the zinc ammonium sulphate.

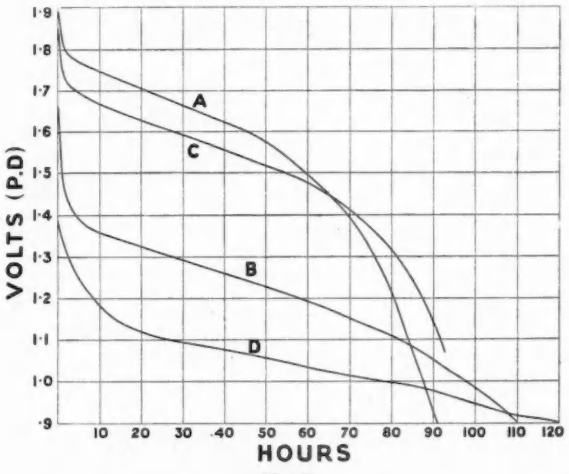


Fig. 2

(A) A.D. charcoal carbon; (B) hard carbon electrode; (C) same carbon annealed; (D) discharge of similar first quality porous pot Leclanché cell. All cells are on 10 ohms.

After a period of rest the main electrolyte will diffuse through to the zinc and the cell will recover. The period of " cut off " naturally depends on the shape of the cell; thus, a tall narrow cell cuts off sooner that a short squat one, as the syrup is concentrated more densely over the zinc. The cell can, therefore, be proportioned to the duty it has to fulfil.

In order to counter crystallisation and to increase conductivity, the addition of various salts was tried. At first it seemed that very small quantities were sufficient to effect the purpose; thus, about one gram of the selected salt would be enough for two pints of electrolyte. Of many salts tried, mercuric sulphate, soda alum, and zinc chloride gave good results. Iron persulphate proved the best for short discharges, but had to be ruled out as it gave deposits of iron oxide on the zinc and cell walls.

Voltage Variations

During these experiments I noticed great discrepancies in the voltage, which varied in different cells from 1.7 to 2.1 V, and also in the rates of discharge. At first this was attributed to the difference caused by some residual salt left over in the interstices of the carbons after washing. However, after considerable trouble and examining a number of carbon samples it was found that the higher voltage and more rapid discharge rates were given by soft charcoal carbons of the nature of Le Carbone A.D. carbons, whereas the lower voltages and long feeble discharges were given by hard metallic looking carbons, or carbons impregnated with paraffin wax. In all cases the total Ah capacities did not vary greatly, but the constitution of the carbons governed the *rate* of discharge.

I subsequently found it possible to increase the capacity for discharge of hard carbons by annealing them for some time at a red heat. Fig. 2 shows the rate of discharge of different carbons in similar electrolytes compared with a similar Leclanché cell. With ordinary carbons of suitable composition the e.m.f. of the cell is approximately 2.02 V.

Reverting to the depolarising properties of the ammonium persulphate, I concluded that in this cell the oxygen does not act directly on the polarising hydrogen as in bichromate or nitric acid cells, but is occluded within the pores of the carbon in a catalytic manner, and that it is the oxygen-charged carbon itself that effects depolarisation, thus accounting for the

* ELECTRICAL REVIEW, Aug. 10th, 1928, " Primary Wet Cells."

differing rates of discharge of different carbons. There is, of course, an indeterminate middle factor, the water, but this probably only serves as a link to reduce the zinc to an oxide at the moment when it is attacked on closed circuit.

Ammonium persulphate dissolved in water may for practical purposes be regarded as a neutral solution, but the addition of even a small quantity of the salts mentioned above gives an acid reaction with a corresponding increase of conductivity.

The Effect of Alkali

Conversely the addition of a small quantity of alkali, such as ammonium or sodium carbonate, or an anti-acid body, such as calcium or magnesium carbonate, will give an alkaline or neutral reaction. Generally, for relatively short discharges

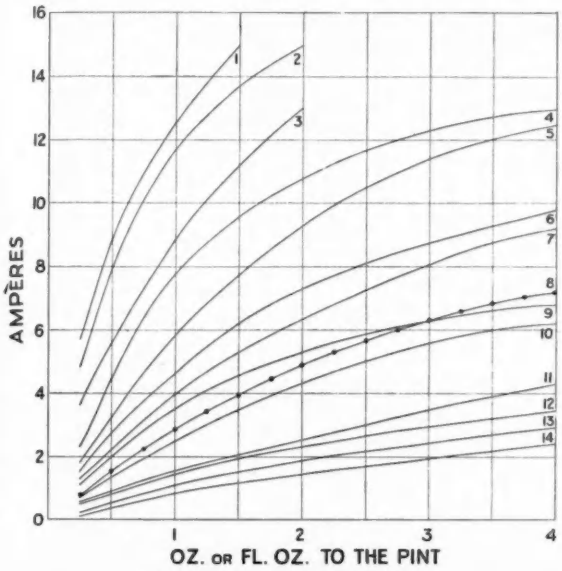


Fig. 3.—Relative Conductivity

(1) Sulphuric acid; (2) nitric acid; (3) hydrochloric acid; (4) caustic soda; (5) ammonium chloride; (6) sodium chloride and sodium bisulphate; (7) ammonium sulphate; (8) ammonium persulphate; (9) zinc chloride; (10) magnesium chloride; (11) sodium sulphate; (12) sodium carbonate; (13) magnesium sulphate and soda alum; (14) zinc sulphate.

the salts giving an acid reaction are the more powerful, but for long open circuit work the alkalis seem to give the better results.

This may be accounted for by the fact that a charcoal-active carbon left in a neutral solution of ammonium persulphate tends to give it an acid reaction, even if no zinc is present to close the circuit.

In view of these new facts observation was made over a number of cells for several months and the conclusion reached was that those cells having the greatest quantity of salts added to the solution of ammonium persulphate (up to a point) gave the best results, probably because the addition of such salts acted as excitants, thereby allowing the ammonium persulphate to fulfil its duty as depolariser unhampered by having to act as an excitant as well.

As there appeared to be no data available about the relative conductivity of common battery salts I conducted rough experiments to determine the point. Two carbon electrodes having each a submerged face area of 6.5 square inches (not counting edge effect) were immersed in a vessel 2⅜ inches apart and an alternating pressure of 7.5 V at 50 cycles was applied to various solutions of salts, at different concentrations.

The area of the carbon electrodes was kept constant, the surplus solution caused by the addition of the salts being drawn off when necessary, but being returned to the vessel on the addition of each charge of salt before again being withdrawn, so that a full mixture of ounces to the pint was always maintained. The temperature was kept as near as possible to 60° F. The curves of acids in fluid ounces to the pint are added for comparison with common battery salts, fig. 3.

Where two salts are given the second is only slightly inferior to the first and is not drawn in to avoid a multiplicity of curves.

The Most Efficient Salts

A second series of experiments with these salts was undertaken, but the quantities were increased from one gram to one or more ounces with beneficial results on both conductivity and crystallisation. Of the various salts tried, zinc chloride appears to be one of the most efficient; in fact, most of the chlorides give good results.

The density of the solution must not, however, be too great and should not exceed 2½ ounces of ammonium persulphate to the pint in a single fluid cell. Each ounce of ammonium persulphate should give 4 to 5 Ah according to the rate of discharge at an average voltage of about 1.5 V, the cell being deemed dead when the p.d. falls to 1 V. This point should not be confused with the point of cut off caused by a too long continued discharge, as the cell will recover after the one, but not appreciably after the other.

The cell can be made up as a two fluid cell if desired, using a solution of dilute sulphuric acid or any of the above mentioned chlorides round the zinc; and if desired a rather stronger ammonium persulphate solution round the carbons. Such a cell will give more powerful results than the single fluid owing to the greater area of electrodes exposed, but is unsuitable for use over more than a few weeks owing to transference of the solutions and subsequent heavy crystallisation of the zinc.

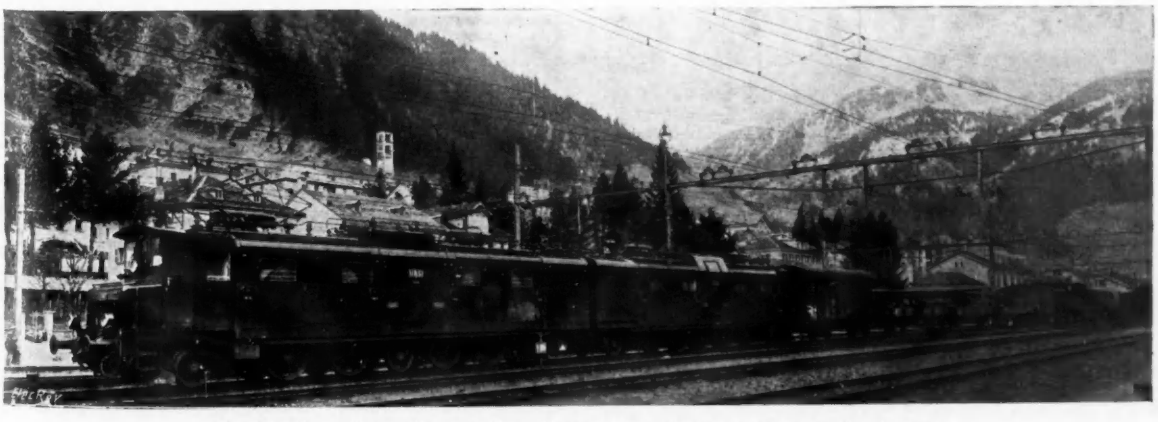
With the single fluid type of cell, unless the drain is heavy, it appears on open circuit that, paradoxically enough, the weaker the solution (within limits) the better the cell lasts. In comparing the results of these cells with those of the Leclanché type it should be remembered that two of these cells in practice are almost equal in e.m.f. to three ordinary sal-ammoniac type cells, so that a saving in space and upkeep is effected. The zinc can be lightly amalgamated in the usual way, but heavy amalgamation, free mercury, or castings of zinc-mercury alloy do not appear to present any advantage; indeed the zinc seems to behave as well without any amalgamation whatever.

Final Conclusions

To sum up, the use of ammonium persulphate as an electrolyte gives us a single-fluid cell of high electro-motive force and reasonably low internal resistance, combined with great constancy and recuperative depolarising power. Local action is small, probably owing to the mildness of the electrolyte used.

The essential components of the cell are reduced to classic proportions, comprising only a zinc, a carbon, and a jar with a lid, making for simplicity and cheapness.

The electrolyte itself is a clear transparent solution, harmless, odourless, clean, and non-poisonous. It does not form growths of any kind within the cell, nor creep, nor attack the connections, even after long periods of disuse, nor does it gas. Being simple, harmless, and easily soluble, ammonium persulphate renders the recharging of such a cell an easy matter for householders or persons otherwise unskilled in the maintenance of batteries. As the salt itself is not deliquescent, it can be stored and packed in simple paper packets without fear of deterioration.



The 8,800-h.p. single-phase Oerlikon locomotive referred to in "Traction Notes"

Municipal Transport Conference

THE thirty-first annual conference of the Municipal Tramways and Transport Association was held in Eastbourne from June 22nd to 24th. The President of the Association—Alderman A. G. Ellaway (vice-chairman, Birmingham Corporation Transport Committee) was unable to be present owing to ill-health, and the conference was presided over throughout by Mr. C. Furness (borough electrical engineer and tramway manager, Blackpool). The attendance was fully up to the average of recent years and two papers of importance to municipal transport were read and discussed. The remainder of the business part of the conference was devoted to a private discussion of experiences under the Road Traffic Act, 1930.

There was a civic welcome in the Town Hall on June 22nd, when the Mayor (Councillor MacLachlan, J.P.) mentioned that the Association represented tramways with a capital value of £82,333,000, buses worth £8,503,000, and trackless trolley systems representing £1,615,000.

[*Elliott and Fry.*

Mr. C. Furness, the new president of the Association

Presidential Address and Annual Meeting

The presidential address prepared by Alderman Ellaway was read by the general secretary. This contained an expression of dissatisfaction at the cost of electricity for traction compared with the prices charged for other large consumers with no better load factor.

The chairman mentioned that all the prizes in the essay competition had gone to employés in the Manchester Corporation Transport Department, Messrs. E. H. Mason, J. G. Manders, J. Brooks, and F. Neal.

The annual general meeting of the Association was then held, and the following officers and members of Council were elected for the following year:—President, Mr. C. Furness (Blackpool); vice-president, Mr. L. Mackinnon (Glasgow); members of Council, Alderman H. Clark (Rochdale), Councillor A. H. Gledhill (Halifax), Mr. A. Baker (Birmingham), and Mr. W. Forbes (Cardiff); hon. treasurer, Mr. A. R. Fearnley (Sheffield); hon. solicitor, Mr. F. H. C. Wiltshire (Birmingham).

Mr. A. C. Baker (general manager, Birmingham) then read a paper on "The Effect of the Development of Housing Estates on Municipal Passenger Transport." In this the author contended that the removal of people from the centres of towns was making it uneconomic to reconstruct tramways.

In opening the discussion Mr. C. Furness said that in many cases the transport of those living on municipal housing estates some distance from the centre of a city was subsidised by the existing tramway services.

Electricity Charges

On June 22nd, Mr. C. Furness read a paper entitled "A Review of Electricity Charges for Traction Purposes." In this he referred to the advantageous load and diversity factors of traction. He pointed out that in spite of the closing of small sections of tramway track the energy used during the year ended March 31st, 1931 (872 million kWh) was 17 per cent. higher than in 1926-27. The most notable increase had been for the trolley bus, the electricity supplied to which had advanced from 7½ million kWh to 27 million kWh in the four years. The average consumption of the trolley bus was 1.6 kWh per mile, and at a cost for electricity not exceeding 0.75d. per kWh, its power cost was less than that of the petrol bus.

He submitted examples of costs and charges for electricity by several supply undertakings (ranging from 0.25d. to 1.68d. per kWh), and claimed that a two-part tariff was desirable, the standing component varying with the capital expenditure and the running component ranging from 0.2d. to 0.4d. per kWh.

Taking the average capital cost per effective kW at £20, to cover land, buildings, machinery, and plant for all classes of supply, after allowing 20 per cent. stand-by and a load factor of 25 per cent., the author arrived at a formula of £2 11s. 9d. per kW of m.d.=0.2835d. plus a running charge of 0.3056d. per kWh (the average cost per kWh sold by 70 undertakings), plus 0.1109d. (interest and redemption on tramway feeders, rotaries, and sub-station buildings); total, 0.7d. per kWh. Interest was taken at 4½ per cent.; redemption at 3 per cent.; rent, rates, and taxes at 219d. per kW (average of 120 undertakings); and management at 3s. 6d. per kW. Adapting the formula to suit individual instances he showed that the charges made would vary from 0.48d. per kWh to 0.757d. per kWh.

Effect of Grid Supplies

In the discussion on the following day, Mr. W. R. Elliott (engineer and tramway manager, East Ham), said that electricity supply engineers could twist any formula to their own advantage! The Central Electricity Board would soon be issuing a number of grid area prices, which should be taken as the basis of the charge for traction. He imagined the grid prices would be about £3 5s. per kW of maximum demand and 0.22d. per kWh, giving an average price on a 25 per cent. load factor of 0.576d. per kWh. Adding cost of conversion would bring the figure to 0.69d. and including management, &c., the final figure would be 0.8d. per kWh; a printometer should be used to ascertain the maximum demand.

Mr. H. E. Blackiston (chief engineer and manager, Ipswich) said that the best way to ascertain the maximum demand was to take the supply at high voltage and fix summation meters connected by pilot cables between the different points of supply. The printometer was also good provided there were synchronous clocks.

The I.M.E.A. Formula

Mr. G. R. Spurr (tramway manager and engineer, Walthamstow) said his undertaking had used the I.M.E.A. formula since 1911 and to-day the price charged for traction was 0.571d. per kWh. Under the maximum demand system the traction department would not have benefited by the liquidation of loans and the price would have been higher. He doubted whether more than twelve undertakings had adopted the I.M.E.A. formula, but although it might seem involved it could be worked satisfactorily. It was surprising to find Birmingham paying 0.9d. for its electricity under this formula and Walthamstow, a much smaller undertaking, only 0.571d. Perhaps the difference was due to the heavy capital expenditure in recent years in Birmingham on sub-stations, &c. If Walthamstow had been allowed to continue to generate for itself the traction supply could have been given at 0.55d.

Mr. P. Clegg (general manager, Haslingden) suggested that the charge to the traction department would still be profitable if the price were based on an average of the station and traction maximum demands.

Standard Coal Clause Wanted

Mr. Furness, replying to the discussion, said he would much rather adopt the involved I.M.E.A. formula than install complicated and delicate apparatus, such as the printometer or summation meters. Electricity supply authorities would be pleased when the Electricity Commissioners devised a standard coal clause. They had already fixed a charge for management, *viz.*, 2s. per kW plus £500 or, alternatively, 2s. 3d. per kW; when the demand reached 48,000 or 49,000 kW it would be found more advantageous to work on the former basis.

Had the I.M.E.A. formula been adopted in Blackpool the charge for traction current would have been higher than the present figure of 0.8d. The cost of distribution to private consumers ought to be ignored when calculating the traction price. In the same way, as Hams Hall power station was not necessary for the traction supply of Birmingham, but had been put up for the general development of supply throughout the country, its capital cost should not be brought into the calculation.

Annual Dinner

The annual dinner was held on June 22nd at the Grand Hotel, Eastbourne, Mr. Furness being in the chair. Proposing "The Municipal Tramways and Transport Association," Councillor S. C. Addison (Chairman, Eastbourne Motor Omnibus Committee) said the strength of the Association lay in the fact that practically all municipalities owning transport undertakings were members of it.

Alderman James (Chairman, Birmingham Transport Committee), in reply, said that last year a profit of £512,000 had been made by the Birmingham Corporation Transport Department. Speaking of the Road Traffic Act, he said that as a member of the panel of Commissioners for the West Midland area he considered that municipal undertakings must be allowed reasonable and legitimate opportunities for developing their transport undertakings. Mr. A. C. Baker (general manager, Birmingham) also replied.

Mr. J. Beckett (general secretary) proposed the health of Mr. P. Ellison (manager of the Eastbourne Motor Bus undertaking) who briefly responded.

On June 23rd, the Association was entertained at luncheon by the Eastbourne Corporation, when the Mayor occupied the chair and proposed "The Municipal Tramways and Transport Association," making reference to the regrettable absence of the president, Alderman Ellaway. Mr. P. Mackinnon (general manager, Glasgow), who responded, pleaded for support of the Association by municipalities, because a total income of £5,000 was inadequate. The transport industry was ranked as the fifth largest industry in the country; it was passing through the most difficult times that, probably, it had ever experienced, but it certainly was not a time for pessimism.

Electricity Regulations in France

At the instance of the French Ministry of Public Works the French Union des Syndicats de l'Electricité has recently drawn up a series of special regulations which must be followed in the carrying out of electrical installations in stormy districts of the country, and especially where lightning is frequently experienced. The regulations in a slightly modified form have been adopted by the Ministry and copies of them sent to all the Government electrical inspectors throughout France.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Supply Engineers and the Grid

I was very much interested in Sir Andrew Duncan's speech at the I.M.E.A. Convention at Cardiff. I understood him to say that the Central Electricity Board proposed at some time in the future to consult with the electricity supply engineers with a view to making the best use of the grid.

It is the opinion of every supply engineer with whom I have discussed the matter (a large number) that if they had been consulted before the grid scheme was decided on they would most certainly not have approved it; and that the money being expended on the grid would, if spent in other ways, have been much more effective in providing a cheap and abundant supply of electricity throughout Great Britain.

There is not the slightest doubt that if there had been no Government interference or restrictive regulations, practically every house in Great Britain would have had a supply of electricity many years ago. SUPPLY ENGINEER.

June 22nd, 1932.

Criticism from Canada

Having lived in Canada for twelve years I feel qualified to add something to the points mentioned in your leader bearing the above title in your issue of May 27th.

The old statement that British manufacturers try to tell overseas customers what they should have, rather than try to give such customers what they want, may be threadbare, but unfortunately it is not worn out. Leaving that aside, there are two very noticeable features that seem to militate against British electrical business in Canada. The first is the very strong position held by the Underwriters' Laboratories of Chicago.

Until recently these Laboratories were practically omnipotent to decide what could or could not be used in Canada in the way of electric wiring devices, fittings and so forth. It is a fact, explain it how one will, that devices from the Old Country are never approved by these Laboratories. Within the last few years the Hydro-Electric Power Commission of Ontario has established its own testing laboratories, and these laboratories approve equipment for use in Ontario, irrespective of the Laboratories in Chicago. It seems strange that British engineers should not be able to show a united front strong enough to break down the Chicago domination.

The other feature is a much more direct criticism of the commercial methods adopted by English and Scottish concerns. In a great many cases manufacturers' representatives seem to think that it is only necessary to open an office and wait for the business to come in. The distance between towns and cities in Canada is very great compared with distances in England, and in the case of the large majority of manufacturing concerns, it is not possible for the purchasing agent or engineer to go down the street to call upon an electrical manufacturer's representative when material or equipment is needed. It is essential that the manufacturer should send competent engineers (not merely "order-takers") to call upon users at their own plants.

Stocks of equipment or parts which are commonly called for must be maintained in Canada, and the manufacturer's business must be so organised that special equipment can be delivered to the user in such a time as will compete with local or United States factories. I could name one or two English electrical concerns of world-wide repute who give splendid service at strictly competitive prices. These firms have a staff of qualified engineers in Canada and seldom fail to live up to their promise of shipment. It is a pleasure to do business with these concerns, which are deservedly prosperous.

I could name other concerns that are held in high esteem on your side of the water, the products of whose factories we should be glad to use, but whose representation is so inadequate both as to quotations and deliveries, and also as to technical matters, that we do not consider them as possible sources of supply.

British manufacturers must organise the commercial side of their business on a par with their designing and manufacturing standards, and they will then get their share of the business. And now is the time to do it.

Canada, *June 11th*, 1932. A CANADIAN ENGINEER.

E.H.P. Switchgear

Mr. L. J. Bamber's contention is that proving tests for rupturing capacity are very essential, but does he insist that *all* circuit breakers should be tested for rupturing capacity before leaving the maker's works? If not, which would he exempt? If all need not be so tested, would the purchasing engineer feel quite as safe with the untested ones as presumably he would with those which had been "proved."

Mr. Bamber must be fully aware that such testing is an extremely expensive and lengthy business, having of necessity, a considerable effect on questions of price and delivery—points of no small importance to the purchaser, particularly under present conditions.

The vital question seems to be whether we can accept Mr. Bamber's apparent contention that it is economically possible at the present time to test every circuit breaker and give indisputable proof that it will successfully serve the purpose for which it was installed?

The testing of samples only surely falls short of the ideal, for who would be prepared to guarantee that if one circuit breaker out of a batch of say six, passed successfully, the other five were bound to be all right? I have never heard of any such latitude being allowed in the matter of pressure tests.

Further, how many "openings" constitute a satisfactory test? It is known that one is quite valueless; the number must in fact, run into many hundreds before anything in the nature of proof is forthcoming; that proof then applies to the particular breaker alone, and can only be taken as a very rough guide as regards others, even of a similar type.

It certainly seems that the value of the "proving" which has been done up to the present is being vastly overrated, thus creating a situation which is apt to be misleading.

June 21st, 1932. QUEBOR.

The radio assembly shops at Ferranti's works, Hollinwood, which have recently been improved

Switch Safety

In my previous letter I set out to show, first, the very great importance of switch safety and, secondly, the simplicity of a definite test which will at once indicate whether any single-pole switch in a completed installation is correctly connected in the live wire or incorrectly connected in the neutral wire.

The test which I detailed seemed clear, simple, and unmistakable, yet Mr. Stimson writes in your issue of June 24th, just like a text book, suggesting that "a good tester would automatically test for the live wire, and a very careful one might in addition use a live wire indicator, but he would also take the precaution of removing the house lamp from its holder before testing."

Let me say once again it is wrong thus to lead young electricians into needless confusion. To recapitulate, the single pole switch under test must remain closed during the test. The lamps of the installation must remain alight in their lampholders. (It makes no difference to the test whether

one or twenty lamps are fed from the switch in question.) It does not matter whether a 25-W or a 100-W lamp is used as a test lamp; if the switch is correctly wired the test lamp will light to full brightness. On the other hand, if the switch is connected in the neutral wire the test lamp will not light up at all.

Edinburgh, *June 25th*, 1932. E. O. CATFORD.

In your issue of June 17th, Mr. E. O. Catford suggests that an undertaking should withhold the supply of electricity unless every single-pole switch is connected in the live wire. Surely the undertaking which installs the meters is to blame if the switches are not in the live wire. When wiring a dwelling-house, any wireman will loop all the switches of one wire or feed, and the undertaking will not install a meter until everything is complete. This means that the wireman has gone off the job before there is a supply of electricity.

I have found, on going back to inspect installations, that it has been necessary in nine cases out of ten to change over the feeds at the main switch, in order that the switches might be in the live wire. A. PILLING.

Littleborough, Lancs., *June 21st*, 1932.

Surely the objection advanced by Mr. W. H. Stimson to the test for switch polarity described by Mr. E. O. Catford is unfounded, as if the lamps are switched on for the test the terminals of all s.p. switches will be short-circuited. There will then be a complete voltage drop across the lamp and if the lampholder is wired direct to the live side of the supply (*i.e.*, incorrectly), while the switch is connected to the neutral, both terminals of the switch are bound to be at neutral potential, which effectually precludes the illumination of the test lamp connected between either switch terminal and earth.

The only way in which the test lamp could be illuminated in series with the main lamp would be to leave the switch off, and a light would then be obtained from one switch terminal and earth.

A test which I have used is to have all the lamps out of their holders and all switches off. Under these conditions no light should be obtained between either plunger of any lampholder and earth if the switches are all interrupting the live side of the supply.

Exeter, *June 23rd*, 1932. W. N. LAVIS.

Copper-clad Steel Conductors

We were very interested to read the remarks of "Keenly Interested" in your issue of June 24th regarding vibrational troubles in No. 8 s.w.g. copper-clad steel conductors. We agree that troubles of this nature will most certainly occur if the conductor is erected without full knowledge of the results of past experience and an appreciation of the characteristics of these small high-tensile conductors.

It is not generally realised that vibration introduces bending stresses which are superimposed upon the normal stringing tensions. If the Commissioners' safety factor of 2 is employed with these small high-tensile conductors, it will be found that when the vibration stresses are added the safety factor even at ordinary stringing tensions may be less than 2. Breakages will then occur at strain clamps, bridle clamps, and possibly at pin insulators. All these troubles can be avoided by careful design of the straining insulator attachments, bridle clips, and pin insulator binds, and by following the makers' instructions, namely, that the wire shall be erected with a safety factor of not less than 5 at a temperature of 60 deg. F. in still air.

Based on our experience we would recommend that a stranded copper-clad steel conductor should always be used in preference to a solid one, not only because of the inherent ability of the former to withstand repeated vibration stresses better than the latter, but also because there is less vibration due to the strands causing an irregular air flow.

We have had in use since 1929 some 7/14 and 7/12 s.w.g. copper-clad steel lines without any breakages or visible signs of vibration. To deal fully with this subject would be beyond the scope of our letter, but we should be pleased to give "Keenly Interested" any information or advice.

R. F. MARKHAM,
London, S.E.7, *June 27th*, 1932. C. ERIC STEWART.

Referring to "Keenly Interested's" letter in the REVIEW of June 24th the following methods may be of interest.

At Suspension Points.—If a short length of conductor, say eighteen inches long, be clipped to the main conductor by means of light clips, one at each end of the short length, and the two wires (short length and main conductor) be bound in to the pin insulator in the usual manner it will be found that this stiffens the job and thus tends to prevent fatigue.

At point of make off.—Use a very light form of suspension clamp and take the wire round a small circular bobbin, the bobbin itself being lightly attached to the strain insulator so that it can readily move, the wire being brought round the insulator in an easy sweep and the end clamped by means of, say, three small clamps to the main conductor. The conductor and wire is then bound round with copper tape at the points where the clamps are fitted.

If sags greater than those recommended in the sag tables for any given span are used, the line is not stretched tight enough and the wires ripple under heavy winds and tend to touch.

Egremont, Cumberland, *June 20th*, 1932. J. E. ROBERTS.

The I.M.E.A. Convention—Annual Dinner

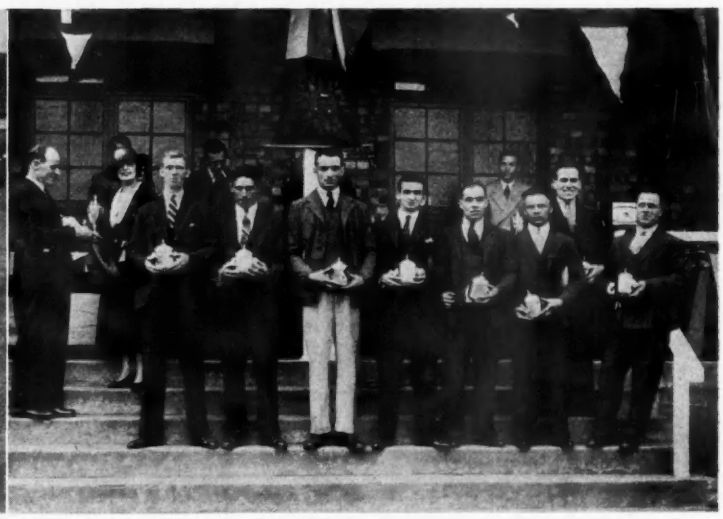
I see from your report of the speeches at this dinner that Alderman Beaumont is referred to as chairman of the St. Marylebone Electricity Committee, but the present occupier of that position is Alderman G. B. Brooks, who is also this Council's representative on the London and Home Counties J.E.A.

Alderman Beaumont was the Council's representative at the Convention and is a member of the Council of the Association, but he ceased to hold office as chairman of the Electricity Committee here some time ago, and I think that in view of Alderman Brooks's position with the J.E.A. an editorial correction should be inserted in your next issue. C. H. SMYTH,

Chief Engineer,
St. Marylebone Borough Council.

London, W.1, *June 24th*, 1932.

[Our reference to Alderman Beaumont was in accordance with the information given in the official list of delegates.—EDS. ELEC. REV.]



Electrical companies' sports: (Left) Miss Porter setting up a world record at Callender's meeting. (Right) Mrs. L. C. Gamage and some prizewinners at the G.E.C. sports

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"British Made"

It is time that public attention was drawn to the misuse of the words "British" and "British Made." Millions of people here think that these words imply that an article is made in this country, whereas it may be made somewhere else in the British Empire. We only obtain the greatest advantage by first purchasing our own products made in Great Britain.

Three markings are required, with extremely heavy penalties for infringements:—

1. "Made in Great Britain."
2. "Made in the British Empire"
3. "Foreign made."

June 22nd, 1932. G. F. SILLS.

Southend Showroom Proposal

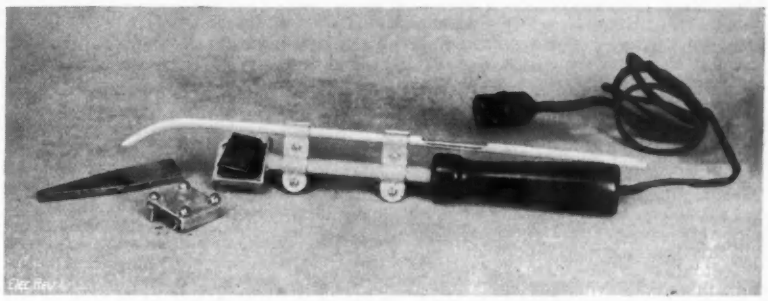
The Town Council has decided, subject to the approval of the Electricity Commissioners, to include in the estimates for 1932-33 a sum of £5,000 for the provision of a showroom.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

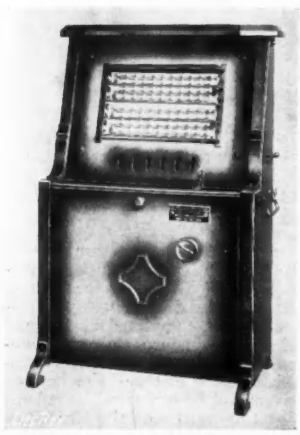
An Electric Soldering Iron

An interesting improvement in soldering irons has been brought out by R. C. RADIO-ELECTRIC, LTD., which is incorporating a "self-feeding" arrangement that gives a continuous supply of solder to the copper bit and leaves one hand free to manipulate the object being soldered. This is accomplished by the provision of a long tube fastened to the soldering iron through which the solder is passed, a metal spring being inserted behind the solder. The copper bit is directly heated by a 60- or 150-W element (there are two models), and can be altered to a right angle position merely by undoing four screws.



The R.C. electric soldering iron with the element exposed

Prepayment Slot Meter Fire



The "Magnet" hotel fire

An electric fire has now been designed by the GENERAL ELECTRIC CO., LTD., Kingsway, W.C.2, for use in hotels, boarding houses and communal flats. A "shilling-in-the-slot" prepayment meter has been incorporated in the base of the fire. The shilling is inserted in the slot immediately under the elements and a handle fixed on the front of the fire is turned, the meter being set at a predetermined figure to suit local conditions and the profit required. The "Hotel" fire is constructed of sheet iron and is fitted with two 1,000-W curved pattern heating elements of new design, one of which is connected direct to the main terminals and the other controlled by a switch on the side of the fire. This fire is portable, but can only be supplied for use on an a.c. supply, a restriction which is due to the meter.

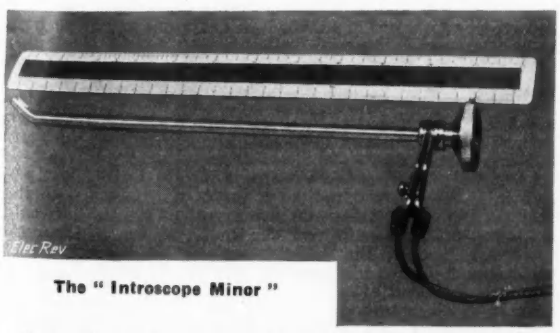
New Dry Batteries

The new range of anode and grid-bias dry batteries introduced at the beginning of this month by the MARCONIPHONE CO., LTD., 210, Tottenham Court Road, W.1, has been extended by the addition of a 60-V battery, which has been specially included to satisfy the large demand which exists for this size.

The "Introscope Minor"

A new device called the "Introscope Minor" has been manufactured by the FOSTER INSTRUMENT CO., of Letchworth, Herts. This instrument is an attempt to solve a problem which has long puzzled engineers in all branches of industry, namely, the examination of the interior surfaces of such structures as condenser tubes and bores in turbine shafts, and places where only an extremely small aperture is available for the introduction of the instrument.

The instrument consists of a metal tube of small diameter and having an effective length of 9 in. At one end is an eyepiece while at the other a small lens and prism are mounted, the surfaces being reflected from the prism to the eyepiece by a series of small lenses mounted along the tube. At the

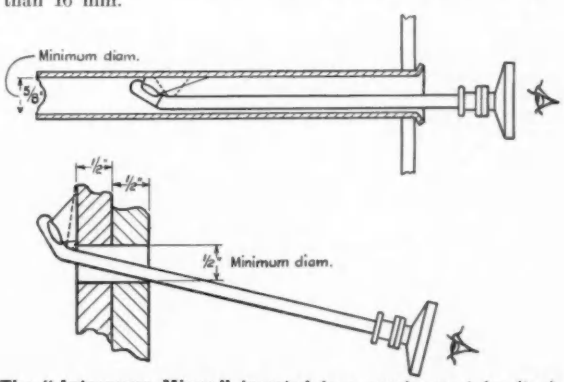


The "Introscope Minor"

end opposite to the eyepiece the tube is bent at an angle to the axis of the main portion of the tube and a minute electric lamp is mounted in this bent portion so that the light strikes the surfaces to be examined obliquely, thus throwing any irregularities into high relief.

The lamp is operated by an accumulator connected to the instrument by flexible cable and a special attachment incorporating a switch, the current being led from the head of the instrument to the lamp by means of special conductors embodied in the main tube itself in order to enable the maximum size of lens to be used. The actual diameter of the tube is 7 mm. and the lamp is so mounted that it may be quickly detached and a "spare" inserted by the user.

While the actual diameter of this instrument is 7 mm., it can only be used in straight tubes having an internal diameter of not less than 16 mm., due to the bent form of the tube, but it can in some cases be used where the aperture is less than 16 mm.



The "Introscope Minor" inserted in a condenser tube (top) and the rivet hole of a boiler

In our top diagram the "Introscope Minor" is shown inserted in a condenser tube for detecting corrosion or pitting, the ends of such tubes being the most liable to attack and usually serving as a guide to the internal condition of the whole length of the tube. The instrument is also shown inserted through the rivet hole in a boiler allowing both the examination of the interior surfaces of the rivet hole and also of the plate surrounding the hole. In both illustrations the dotted lines from the bottom optical system show the section of the interior surface as seen through the eyepiece while the continuous lines represent the beam of light from the small electric lamp.

In addition to the two typical cases mentioned innumerable other applications exist for such an instrument, for instance, the examination of turbine blades without the necessity of removing the casing.

A New Lampholder

Our illustration shows a new porcelain lampholder which is being placed on the market by MESSRS. DORMAN & SMITH, LTD., Salford. As all metal parts are plated and secured in the pot by the "D & S" method, which avoids the possibility of terminals or plungers becoming loose, the lampholder is assured a long life.

An unusual refinement is the provision of large terminals permitting looping, each having two pinching screws to ensure the permanence of an efficient connection in spite of any vibration or shocks to which the lampholder may be subjected when in use. It will be noticed that the lampholder skirt covers the whole of the metal cap of the lamp, complying with Home Office regulations.

Two "knock-outs" have been provided in the porcelain base so that wiring may be easily and neatly carried out when the lampholder is used as a simple open type fitting in conjunction with surface wiring systems.

A new "D & S" lampholder

Legal

MR. JUSTICE LAWRENCE, sitting in the King's Bench Division continued the hearing of the defence in the action in which Radiovisor (Foreign and Colonial), Ltd., seeks to recover from Radiovisor Parent, Ltd., £200,000 damages and the return or cancellation of 120,000 £1 shares, on the ground of alleged misrepresentation in the sale by the defendants to the plaintiffs of the foreign rights in a selenium light bridge. The plaintiffs' case was that the bridge did not yet fulfil a representation the defendants were alleged to have made that it was commercially capable of mass production.

Continuing the evidence for the defendants, Mr. W. A. G. Barrett, an employé of the defendant company, stated that he had made tests upon various bridges, and found their performance very good. The bridges might vary from time to time, but this year there had been no adjustment necessary.

Up to 1930, where there was a distinct change in temperature, there was a marked alteration in the resistance of the bridge, but there had been improvements since.

Mr. D. McD. Broughton, formerly works manager of the defendant company, said he designed the polarised relay used in connection with the bridge. Up to the end of 1928 he tested practically all the bridges sent him from the Bridge Department. The bridges were not the chief cause of any trouble in connection with the lighting units. It was found that hot weather decreased the resistance and increased the current, but a bridge which was continuously on circuit settled down to a constant resistance.

Mr. C. L. F. Clutterbuck, formerly technical managing director of the Parent Company, who was associated with Mr. Neale in the invention of the bridge, admitted that at demonstrations he told people that the bridge was cheap to manufacture. At an early stage of the tests they had eliminated the moisture bugbear and found the way to pass a small current which would not destroy the material, and having, thereafter, read the "dark" current for a week they were entitled to say the bridges were constant in resistance. While they found that temperature affected behaviour, they came to the conclusion, from the Barnes and Coventry Street experiments, that it was not sufficient to upset the unit.

The 1928 prospectus did not imply that temperature had no serious effect, because they were not in a position to pronounce on it. When at length they had a report showing the destructive effect of temperature tests it filled them with alarm, but it was only in laboratory conditions, and had no bearing on the bridge in commercial production.

The hearing is proceeding.

Parliamentary

(BY OUR SPECIAL REPORTER)

ON June 21st Lord Plymouth, Parliamentary Secretary to the Ministry of Transport, informed Lord Denbigh that as the result of the working of the automatic light signals in Oxford Street, the Minister of Transport had definitely come to the conclusion that it would be desirable to erect similar systems in different parts of London where the traffic conditions were suitable. It would be a great mistake to overdo these signalling systems and scatter them broadcast about London. It was true that their erection was not proceeding as quickly in London as in the provinces and elsewhere, but that was due partly to the special conditions of local government in London, which made negotiations more complicated and prolonged. Recently, things had been moving more quickly in the matter.

Wireless Diffusion

In reply to a question regarding wireless diffusion services, Mr. H. G. White, the Assistant Postmaster-General, said that the system under which wireless exchanges were established for the reception of broadcast programmes and their distribution by wire to subscribers' houses had been in operation for several years. About 150 licences had been issued by the Post Office to companies and private individuals for the establishment of such exchanges in various parts of the country. No local authorities had applied for licences.

Railway Electrification

On June 22nd Mr. McEntee asked the Minister of Transport if he would give the latest information regarding the progress made in the promotion of schemes of railway electrification.

Mr. Pybus said that the Southern Railway Company had informed him that it was at present proceeding with a scheme for electrifying the line between London, Brighton and Worthing. The section covering Redhill and Three Bridges would be open for electric traction in July, and the company anticipated that the whole scheme would be completed at the end of the year. The London and North Eastern Railway Company stated that it had schemes of London suburban electrification under consideration, and that in the event of the London Transport Bill becoming law it would be prepared to submit proposals to the Standing Joint Committee of the Transport Board and the railway companies which the Bill proposed to set up.

Mining Electrical Engineers' Conference

THE Association of Mining Electrical Engineers held its annual conference in Glasgow last week. The meeting opened with a reception on Monday evening by the president of the West of Scotland branch, Mr. A. F. Stevenson, in the Grand Hotel; the attendance, including wives and friends of the members, numbered about 300.

On Tuesday visits to works in the neighbourhood were arranged, and the following establishments were inspected: Messrs. Anderson Boyes' Flemington works; Messrs. Mavor and Coulson's Bridgeton works; Messrs. Mavor and Coulson's conveyor works at East Kilbride; and Messrs. Drysdale and Co.'s works at Yoker. Later in the afternoon the parties met and journeyed to the hydro-electric power station of the Clyde Valley Company at the Falls of Clyde.

On Wednesday several excursions which had been arranged were undertaken in beautiful weather. A large number took advantage of a trip to Edinburgh, where visits were paid to the corporation power station, to Messrs. Bruce Peebles' and other works.

On Thursday evening the delegates were entertained at a civic reception in the Municipal Chambers. In welcoming the members of the Association to the city, the Lord Provost, Sir Thomas Kelly, said that one of their great objects was the reduction of risks attending the application of electricity to the mining industry and to promote the adoption of reliable methods of securing safety.

Major E. Ivor David, president of the Association, thanked the Lord Provost for his welcome, and as a justification for the existence of the Association pointed out that wherever the Association was strongest the toll of accidents in the mines was lowest. Mr. A. F. Stevenson also spoke.

The Annual General Meeting

At the annual general meeting on Friday afternoon in the Grand Hotel, Major E. Ivor David, the retiring president, said that they must have a sufficient number of certified colliery electricians available if they were going to press for the exclusive employment of certified men. Since the Association had started its examinations, 765 men had entered, and of this number 15 had secured honours certificates, 274 first-class certificates, 180 second-class and 54 service certificates; 242 had failed. The result was creditable out of their total membership of just over 2,000.

The following office-bearers for the year were then appointed: President, Mr. Frank Beckett; vice-presidents, Messrs. R. Ainsworth and H. J. Fisher; hon. treasurer, Mr. Roslyn Holiday. In his presidential address Mr. Becket emphasised the importance of the efficient maintenance of machinery. He was afraid that owing to the stress of foreign competition maintenance had been allowed to deteriorate. British coal-face machinery was of a high standard—superior to that used in any other country—and should be maintained as far as practicable at the same level. There was a point beyond which any reduction in maintenance costs would result in jeopardising the working of the plant.

Electrical Engineers and Fuel Technique

At the dinner in the evening, which closed the conference, Mr. Robert Forrester, president of the Lanarkshire Coal Owners' Association, replying to the toast of "Our Guests," paid a high tribute to the work of electrical engineers in connection with the production of an automatic electrically impelled solid fuel for boilers with thermostatic control. The coal trade was menaced by the free import of foreign oil fuel, some 5,000,000 tons of which came in last year. This fuel had a coal equivalent of 10,000,000 tons, representing the work of 40,000 miners. The solid fuel could be produced from either anthracite or bituminous nuts at a quarter the price of fuel oil, and beyond the removal of some ash the plant required practically no attention in operation. He congratulated electrical engineers on having designed a plant which, he believed, would revolutionise and popularise the use of solid fuel and relieve unemployment in the coal mining industry.

Lieut.-Col. M'Innes Shaw proposed the toast of "The Association," and said the mining industry was indebted to the skill of mining electrical engineers without whom it would not have been possible to work our small coal seams in successful competition in the world's markets. He appealed to politicians to drop party interests and endeavour to raise the world from the pit of depression by cancelling war debts and adopting a wider programme of disarmament.

The chairman, Mr. Frank Beckett, the new president, in reply, said one of the main objects of the Association was to secure safety in the mines. The rate of accidents in 1930 was only one-half of what it was in 1923, and this result had been secured by the fostering of the technical education by the Association of those responsible for the operation of the plant.

"The Corporation of Glasgow" was proposed by Mr. Roslyn Holiday and replied to by the Lord Provost. The retiring president proposed the health of the chairman, who replied briefly.

To Earth or to Insulate? By Harry Moss, A.M.I.E.E.

IT has always been argued that the taping and braiding of v.i.r. cables were only a mechanical protection to the rubber, which is the insulating medium, and they may once have been essential to this purpose. Generally speaking, as wood casing was installed in dry buildings, the taping and braiding was kept dry, so that the rubber was protected by a dry tape, a dry cotton braiding, and dry wood, all of which helped to increase the insulation resistance to earth.

When steel conduit was introduced we still continued to use the same classes of wire, but surrounded them by a conducting medium erected on dry wood or dry walls in a building. But the tubing system generally was not earthed, and so there was little inducement for the current to try to get away from its proper conductor, and the voltage was usually lower than it is to-day.

The earthing of metallic coverings of wires is now the acknowledged practice, but in the meantime millions of feet of steel tubes have been erected in both dry and damp situations and every effort been made to earth them efficiently, so that the current-carrying wires, with the same insulation as in the old wood-casing days, are now surrounded by a covering that induces the now higher voltage current to break down the insulation and leak across to a medium at earth potential.

We are still sticking to tapes and braids on wires and cables, and these media alone on many conduit jobs are the causes of endless trouble. In perfectly dry situations with the old wood casings, this tape and braiding may be an additional insulating medium, but, erected on damp walls or in any damp situation, or where condensation is likely to occur, they act like a syphon or sponge and suck up the moisture which creeps into terminals of fittings such as switches or fuses.

In damp cellars, where the tube systems terminate for the meters and supply fuses, and several cables are exposed for from six to eighteen inches of their length, this moisture creeps along the cables, setting up rusting inside the tubes, with consequent rotting of the braiding, &c., and all sorts of chemical and other effects.

The Virtues of Tough Rubber

The question arises as to whether the time has not come when an additional layer of tough rubber of corresponding thickness should be used in place of tape and braid. This departure would, I think, prevent much of the trouble for which tape and braid are responsible, and would add nothing to the cost of the cable, because the cost of the additional rubber covering could be balanced by the saving on tape and braid.

Although every effort is made to perfect insulation—to keep the current in its proper place, the conductor—yet we surround the wires and cables with steel tubes and lead sheathing at earth potential, and invite the current to do its utmost on every inch of wire and cable to find the weak spots and get across to earth.

Shouldn't we do far better by insulating and further insulating (thereby adding protection from leakage and increasing the resistance to earth) and by doing away with all " earthed " surroundings? Tough rubber sheathed wires are, class for class, far superior to the taped and braided type from the insulation standpoint, and are infinitely safer from leakage, creeping, &c.; they bring us closer to the ideal of a perfectly insulated shockproof job.

Extensions by Unskilled Persons

There is room for more abuse with tubing and lead-covered jobs than with tough-rubber jobs, especially when they are handled by the amateur or inexperienced person who still persists in making alterations and extensions to installations. With the rapid development of electricity supply into all kinds of small cottage property, both in towns and in the rural districts, the all-insulated job, composed of tough-rubber sheathed wires, with all-insulated holders and switches, is going to be the safest to install, give the least trouble, and prevent numerous accidents.

No steps have yet been taken by the authorities to make it illegal for unauthorised persons to extend, alter, or repair electrical installations, and as development is going on rapidly all over the country, in the smaller property, the all-insulated system of installation without any metallic sheathing or tubes of any kind is the one that will make for the safety of this class of consumer. This does not cut out the conduit system, because there will always be a field for it on the higher-class jobs, but these can be improved by further insulation instead of by tapes and braids.

Alternating current at 230 V is not to be trifled with by the general public, who know nothing, or very little, about electricity, and insulation is one of our chief planks on the " safety first " platform. The all-insulated system will not be suitable for all jobs. For power installations efficient earthing will still have to be the rule.

The question of the earthing of portable apparatus, such as radiators, irons, &c., will arise, especially in that class of property with " earthed " floors, but it is better to deal with this by running a special earth wire to all these points rather than depend on the metal sheathing or other systems whose continuity is often broken.

The advent of the all-insulated hair dryer is a step in the right direction, and I feel convinced that there will be far less trouble from breakdown with this class of appliance than there has been with the metal-cased articles, and also far less risk of accident when they get into the hands of the users.

A Model Outdoor Sub-station

THE collection of electrical and mechanical apparatus which forms the Industrial Museum of the Factory Department of the Home Office includes many examples of the most modern apparatus. It is installed in premises in Horseferry Road, Westminster, and is open to the public every week-day.

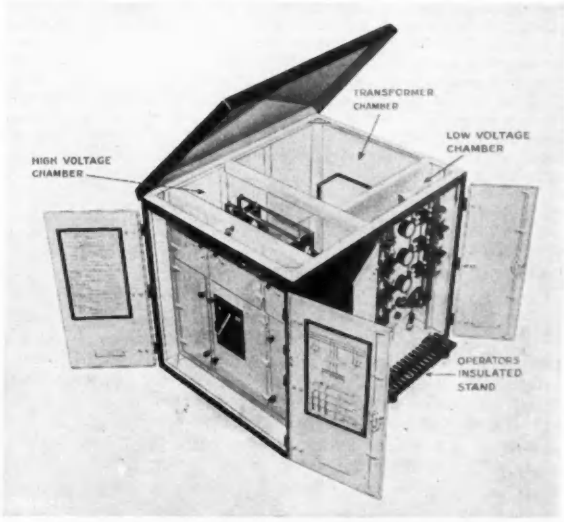
Amongst the most recent acquisitions is a model, about one-third full size, of a typical welded steel sub-station for outdoor service. The model includes a step-down transformer with a complete equipment for operating from an e.h.v. ring main and supplying l.v. distribution circuits. At the high-voltage end two large doors open to reveal six separate chambers, each enclosed by a lockable door. Each of two lower compartments contains a cable box for an incoming feeder, and each upper one a three-pole isolator operated from outside the inner door by means of a removable handle. Of the middle compartments, the upper one houses a three-pole isolator, and the lower one a hand-operated oil circuit breaker for the h.v. side of the power transformer.

The complete circuit breaker can be drawn out; no lifting is required. The time-limit fuses and trip coils of the circuit breaker are mounted on the front of the inner compartment door and are easily accessible for inspection and adjustment. Thus all high-voltage conductors are behind locked doors. Prominent on the inside of one of the outer doors is a large diagram of the connections of the sub-station.

The transformer compartment, with two doors, contains a transformer mounted on rollers, which run on rails adjustable to the pitch of the rollers; it also contains necessary e.h.v. and l.v. connections. The l.v. compartment, also enclosed by two outer doors, is fitted with fuse units, ammeters, and neutral links for 3-phase, 4-wire distribution. A feature of this compartment is the insulated platform provided for the safety of the mains man when examining fuses. It is hinged so that it cannot be taken away, and folds into the body of the sub-station when not in use.

The sub-station shell is of welded steel construction throughout, with a one-piece roof strengthened by ribs on the under side. The roof is held in position by cams and can easily be removed on site. All the outer doors are fitted with three-point locks and rustless hinges; when opened the doors can be lifted off. Ventilating louvres are fitted to the outer doors.

All these details are reproduced in the model. In addition, a portable hand lamp and flexible lead are provided in the l.v. compartment, and suitably placed low-voltage lamps



The model sub-station in the Industrial Museum

illuminate the interior. All connections are painted in the B.E.S.A. colours.

The model represents one of the many types of steel sub-stations made by the Metropolitan-Vickers Electrical Co.

Electricity in Industry

Report of the Inspectors of Factories and Workshops for 1931

THE factory report for last year has now been published by H.M. Stationery Office (2s. 6d. net). Sir Gerald Bellhouse (chief inspector), referring to the appointment of seven new electrical inspectors, points out that the value of their work is reflected in the fact that there has been no increase in accidents commensurate in the least degree with the increased use of electricity at higher voltages. The electrical accident rate (five-year average) has increased by only four per cent. in the last ten years. Electricity also facilitates the employment of individual drives of machinery with the elimination of overhead shafting, making for a safe and economical lay-out. Electric heating and baking ovens, in one instance on a large scale, are mentioned; the control of temperature enables better bread to be produced, with considerable saving in labour and improvement in the workers' conditions.

Few factories have really satisfactory lighting installations. Glare due to unshaded or unsuitably placed lamps is common, and intensity of illumination is too often below even a moderate standard. In iron foundries, where the surroundings require specially good lighting, the majority have less than 1½ ft.-candles and only 11 per cent. have five or more. In many factories no improvements in the lay-out of the installations or the design of fittings have been made since 1913.

Good use has been made of the industrial museum (97, Horseferry Road, Westminster), and some large firms send parties of engineers and foremen once a year to be shown round.

Lead and Mercury Poisoning

Lead poisoning in electric accumulator works shows a relatively low incidence, although this industry has been fairly busy. This is attributed to the co-operation of the manufacturers and to the appointment of a medical officer to supervise a group of works.

Of six cases of mercurial poisoning reported, three occurred in repairing electric meters, due to handling the mercury-coated discs, volatilisation from receptacles containing dirty mercury, spillage, and cleaning mercury where the final drying at a sand bath in the workroom was without exhaust ventilation.

In his report Mr. H. W. Swann, Senior Electrical Inspector, gives the number of reportable electrical accidents as 321 (22 fatal) out of a total from any cause of 113,249 (755 fatal). Out of 35 electrical fatalities in places other than factories which came unofficially to the knowledge of the department, 14 occurred on domestic premises.

It is commonly thought that electrical failures, such as explosions of circuit breakers, are not reportable when the period of interruption of supply is less than five hours, but the obligations are in respect of plant and not supply. Dangerous occurrences at unattended sub-stations are also reportable, as the inspecting and maintenance staff is " employed " there.

Attribution of Accidents

The largest number of accidents (85) was due to switchgear for less than 650 V (3 fatal). Defects in cables and flexibles came second (44); investigation of the four fatalities showed that maintenance depended mainly on the observation and action of non-technical men.

The use of portable apparatus caused 25 accidents, of which six were fatal, mainly due to uncertainty of earthing and the certainty of handling. Muscular contraction with inability to effect self-release causes the victim to be held until dead. Voltage reduction for certain classes of work, such as in shipyards and brick and cement works, or in outdoor situations, may be advisable. Light portable transformers in teak cases for supplying two or three portable lamps are obtainable from British firms.

Seven fatalities were caused by unskirted screw-cap lampholders in 1930. Discussions with the leading manufacturers were followed by the production of inexpensive skirt extensions for earlier types of holder, and no fatalities from this were recorded in 1931.

The number of accidents to technical grades increased from 117 in 1930 to 146 last year, but those to non-technical men were reduced from 212 to 152. Burns accounted for 193 accidents, shock and burns 40, shock and fall 17, and shock 53. An accident is not reportable unless it causes disablement for more than three days, and the cases of shock reported must have been severe; of the 22 fatalities recorded only one (a switch explosion) was solely due to burns. Shock fatalities were 18.7 per cent. of the total accidents reported as involving shock.

The majority of fatalities (14) occurred at from 200 to 250 V, but there were nine non-fatal shocks at more than 1,500 V. Duration of shock and total resistance of circuit are the deciding factors; there is no evidence that bodily health is material. The importance of prompt application of artificial respiration is stressed.

Heavy-duty Switchgear

The problem of control apparatus sufficient in size and power to meet modern supply conditions is likely to increase in importance. Undertakings have been visited where no steps have been taken outside the main station to ascertain the maximum short-circuit values attainable. In some cases obsolete high-voltage fuses or small switchgear for auxiliaries were connected alongside and subject to the same duty as new heavy-duty switchgear. As a substitute for expensive high-rated switchgear a combination of area master switches set for instantaneous action and controlling groups of smaller switches, each fitted with a purely mechanical delay device, has been carried out in one case on a considerable scale. The delay action is so devised that if the maximum setting current is exceeded the switch will eventually open, even if the short circuit is not sustained; heavy short circuits operate first the master switch and then a local switch, which remains out.

Experience of accidents with outdoor switchgear shows that designs in which units of switchgear are carried on separate plinths or trestles are preferable to those in which it is possible to walk or climb along a continuous structure from one section to another.

Kiosk Sub-stations

Mechanical means of operating isolators in kiosks is desirable so that no cell fronts need be opened, especially in the dark. When kiosks are supplied from ring mains, in order to realise the advantages of the duplicated supply, the cable terminations should be independently accessible, preferably by enclosure in separate cells. If it is necessary to enter the transformer compartment, the h.v. terminals and leads should be securely protected. The back of the medium-voltage switchboard or fuse unit must be screened if live conductors are exposed. Consideration should be given to the use of hinged weather hoods, lights fixed to the insides of doors, separate keys, and hinged lift-up insulating stands in front of medium-pressure switchboards.

For testing whether a cable is dead by spiking an apparatus comprising a cartridge-fired captive bolt has been tried with success.

Crane drivers are exposed to risk of shock and there have been reports of injuries caused by electrical fires in cabins, chiefly due to ignorance or misuse. Drivers seldom have sufficient electrical knowledge to warrant their renewing fuses or adjusting contactors. It is often possible to screen trolleys from the driver by guards fixed to the crane. Switches, boldly labelled to indicate their purpose, should be provided in the neighbourhood of the crane to control the trolleys.

There were 118,120 electricity works or departments coming under the regulations. The number of accidents reported in electrical engineering works was 3,844 (nine fatal), of which 43 (none fatal) were due to electricity. Out of 820 (17 fatal) accidents in electric generating stations, 5 fatal and 72 non-fatal were attributed to electricity. Prosecutions included 29 charges relating to electricity, and 16 convictions were recorded.

The Two Voices

SIR FRANCIS GOODENOUGH (chairman), British Commercial Gas Association), speaking at the South-Western District conference of the Association, said that gas could never be seriously affected by the competition of electricity, however sedulously that method of distributing coal power might be fostered by Ministers of the Crown and others who were already trembling at the pending disclosure of the cost of the grid and its effect on the price of electricity when all the capital charges had to be met annually by the users of electricity. The all-electric age was going to cost this country a pretty penny before it eventuated. When the true history of the grid came to be written it was likely to form an outstanding warning against State-aided and State-boosted enterprise.

The gas industry had never been in a more sound position relatively to the general trade of the country or had a more assured future, provided it was given freedom from obsolete legislation and allowed to sell its product on commercial lines.

Mr. James Bell (engineer and manager, Corporation Gas Works, Dumbarton, and president of the Waverley Association of Gas Managers), speaking at the annual meeting of the Association, at Edinburgh, said that gas must enter into competition with electricity and abandon the complacent attitude that there was room for both. The electrical schemes (including the policy of uniformity of voltage and frequency) were involving a huge expenditure, but there was little doubt that they would bring a full reward, much of it at the expense of gas. Gas had already lost prestige in lighting owing to inefficiency in the use of adjustable burners; its progress in heat and power would depend on the supply of a product that would suit appliances without the need of regulation. The electrical consumer was not asked to experiment with his lights and cookers, and the gas consumer, who knew little or nothing of the principles of combustion, often turned to the mechanical simplicity of their rival service. It was idle to talk of gas as an up-to-date service when consumers' installations failed to give satisfactory results.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

"Electrical Review" Index

The Index to Vol. CX (for the half-year ended June 30th, 1932) will be published shortly. Names and addresses of those who require it (free of charge) for binding purposes, or wish to retain it for reference, should be sent to the Publisher, 4, Ludgate Hill, E.C.4.

A New Philips' Organisation

Owing to the rapid development of business and the widening field of activities, Messrs. Philips Lamps, Ltd., have established a separate organisation, under the title "Philips Industrial," which, as from May 1st, 1932, has taken over the control and marketing of a number of products hitherto handled by their X-ray, Rectifier, Amplifier, Special Products, Welding, and Raw Materials Departments. The head office of the new organisation is at 145, Charing Cross Road, W.C.2.

The E.D.A. July-August Programme

In order to emphasise the electric cooking idea the window display for June (illustrated in our issue of June 10th, p. 854) has been retained in the July-August programme of the British Electrical Development Association, the only variation being a change in the slogans which are "Electric Cooking is Automatic" and "Perfect Control at the Touch of a Switch." A reminder is given of the advertisements dealing with cooking, refrigeration, fans, and labour savers which the Association has prepared for use in local papers. The programme emphasises the fact that "Summer time is poster time," and three posters are illustrated which should appeal to the public during the long summer days. The price list of publications for July and August covers electric cooking, fans, and refrigerators.

A Southend Exhibit

The accompanying illustration shows a stand at the recent British Empire Exhibition in the Kursaal, Southend-on-Sea, upon which was displayed a collection of Falk, Stadelmann &

A display of "Efesca" domestic electrical apparatus at Southend

Co.'s "Efesca" domestic apparatus. The facia bears the names of members of the local branch of the Electrical Contractors' Association, who have the approval of the Southend Electricity Department.

Skefko Company Comes of Age

Twenty-one years ago the first "SKF" bearing was manufactured at the Luton Works of the Skefko Ball Bearing Co., Ltd., and to celebrate the event a booklet has been published entitled "Attaining a Majority," which gives a brief pictorial description of the company's works and manufacturing methods.

The New Ford Works

On Friday last week Press representatives paid a visit to the new works of the Ford Motor Co., Ltd., at Dagenham, where production has recently commenced although the many-sided constructional activities have not yet come to an end. The visitors were first impressed by the gigantic electrically operated loading and unloading system at the company's jetty, which includes two electrical unloaders capable of handling 300 tons an hour each. The huge engineering shops are notable for the absence of shafting and belts; all the big mass-production machine tools are driven by incorporated electric motors. The company recently placed an order for 5,000 motors with a British company. In the shops there are also examples of electric furnaces, all the windows and roof lights are operated electrically and the ventilation and heating is electric. At present the company is taking its electricity from the County of London Electric Supply Co., Ltd., but a power station is in course of erection which will house a 34,000-kVA B.T.-H. turbo-alternator as well as a 3,570-kVA service set.

"B.I." Factory Extensions

The increased demand for fine copper wires, plain, tinned and enamelled, has necessitated the erection by British Insulated Cables, Ltd., of a new three-storey building at Prescot. The new premises, which will be completed in August, are 260 ft. long by 77 ft. wide. The whole of the fine wire drawing plant will be accommodated on the first floor, together with rewinding and diamond polishing plant, while the tinning and annealing plant will be on the second floor, the ground floor being utilised as stores. Transport will be carried out by

New "B.I." buildings now in course of erection at Prescot

means of electric bogies which will be despatched from floor to floor by means of electric lifts. The whole of the company's enamelled wire department was recently transferred to the Huyton Quarry Works, where further new plant has been installed in order to deal with the increased volume of orders. During the first three months of the year, the output of B.I. enamelled wires was more than double that of the corresponding quarter of 1931.

Morris-Commercial Developments

With a view to enlarging their already wide markets Morris-Commercial Cars, Ltd., have decided greatly to increase their production possibilities. The scheme in part necessitates the removal of certain machinery and stock from Soho, Birmingham; the installation of new plant at Adderley Park; and the subsequent development of these extensive works along the most modern lines. The removal is timed to commence shortly, and will be completed before the end of the current year. There will be no interference with the normal routine during the process of changing-over.

Switchgear Manufacturer's Extension

Owing to the increasing demand for its products, Standard Switchgear, Ltd., is carrying out considerable extensions to its works at Hornchurch, Essex.

Another "Northmet" Showroom

Last week the nineteenth of the showrooms provided by the North Metropolitan Electric Power Supply Co. was for-

The new "Northmet" showroom at Kenton

mally opened at Kenton, Middlesex, by Mrs. Webb, a member of the Wealdstone Council, in the presence of Sir Ernest Clark (director) and other officials of the company. As will be observed from our illustration, the new building, which has been erected to cater for the electrical requirements of the rapidly increasing number of consumers in the Wealdstone and Kenton districts (3,300 in 1928; 7,400 to-day), occupies a large frontage on Kenton Road and every convenience has been arranged for practical demonstrations of appliances.

Trade Announcements

Messrs. Wright & Pull, Boscombe, are opening additional premises as electrical showrooms at 806, Christchurch Road.

The Hart Manufacturing Co. is taking over its new factory and executive offices at Gunnersbury Avenue, Chiswick, W.4, on July 4th. The new telephone number is Chiswick 6444-5 and the telegraphic address, Hartmanco, Chisk, London.

Owing to the annual staff outing, the London depôt of the Revo Electric Co., Ltd., will be closed to-morrow (Saturday).

Messrs. Taylor, Tunnicliff & Co., Ltd., have terminated the inter-service agreement that has been in force for the last two years between them and the Ohio Brass Co. All the insulator designs supplied by them heretofore will, however, be available in the future, as the manufacture and sale by them of such insulators will not in any way be affected by the termination of this agreement.

A part of the " Northmet " display at Hatfield

The Sturtevant Engineering Co., Ltd., of Queen Victoria Street, London, E.C.4, asks us to state that they are not connected with Sturtevant & Co., Ltd., electroplaters, of Euston Street, N.W.1.

Social Events

The English Electric Co., Ltd., held an inter-works sports meeting on June 18th at Stafford. There was a varied programme, including hockey, golf, and cricket matches, athletics, bowls, billiards, tennis, tug-of-war, fire drill, and swimming. When presenting the silver cups given by the chairman, Sir Holberry Mensforth, Mr. G. H. Nelson and members of the management, Mr. Nelson referred to the admirable team spirit shown throughout the day, and Mr. Firth (chairman of the Bradford Sports Executive) replied.

The annual sports meeting of Messrs. Crompton Parkinson, Ltd., was held last Saturday on their ground at Chelmsford. The president, Lieut.-Col. C. Hardie, officiated as referee, and visitors included Mr. E. C. Holroyde, Mr. T. H. Windibank, Canon W. E. R. Morrow and Miss Morrow, and the Rev. W. S. and Mrs. Brownless. Over 600 entries were received for the thirty-two events, all of which were keenly contested. The Hardie Cup for the section scoring the most points was won again by the Apprentices, and the Ladies' Cup, presented by Mrs. C. Hardie, went to the Transformer Department. The prizes were distributed by Mrs. C. Hardie.

The outing of the South Metropolitan Electric Light & Power Co., Ltd., the West Kent Electric Co., Ltd., and the Chislehurst Electric Supply Co., Ltd., took place in splendid weather on June 18th, the venue being Folkestone. A record number (265) of employés participated, and the luncheon, held at the Royal Pavilion Hotel, was presided over by the local manager, Mr. W. J. Allbright.

The annual sports meeting of the London establishment of the General Electric Co., Ltd., was held on Saturday last at the company's sports ground, Preston Road, Wembley. Once again the occasion was favoured by fine weather, and there was a record gathering to witness the fifty events. The extensive programme was carried through with the usual punctuality, and the keen inter-house rivalry, which is always a feature of these meetings, was enhanced by a new trophy, presented by Mr. L. C. Gamage, and awarded to the London establishment receiving the highest aggregate of points; this was secured by Osram Works, the Head Office being runners up. Sir Hugo and Lady Hirst were prevented from being present through indisposition, and at the conclusion of the events the prizes were distributed by Mrs. Leslie Gamage.

The annual sports meeting of the Callender Athletic and Social Club took place at the club ground, Belvedere, on June 25th. The general standard of events was high and in one instance resulted in the breaking of a world record. The London Olympiads A.C. " A " team in the Women's A.A.A. 660-yd. relay championship lowered the previous record time of their own making in 1928 by 4/5th sec. The team of four included two internationals—E. M. Hiscock and G. A. Porter. Among those present were Sir T. O. Callender, president of the club, accompanied by Lady Callender, who presented the cups, prizes, &c., and several prominent members of the company, Messrs. C. Pipkin, W. G. Hendrey, H. Foulds and E. M. Malek. Callender's Cable Works " A " Band gave selections during the afternoon.

The touring team of the cricket club of Messrs. A. Reyrolle and Co., Ltd., which was in London last week, gained victories over Henley's Club, Gravesend, and the Faraday House Club at Molesey, the matches against the Charing Cross Electric Supply Co.'s Club at Gunnersbury Park, and the North Metropolitan E.P.S. Co.'s Club at Brimsdown being left unfinished.

The Great Hertfordshire Show

The comprehensive electrical display and demonstration of the North Metropolitan Electric Power Supply Co. at the Great Hertfordshire Agricultural Show at Hatfield last week may perhaps be best judged by the fact that for the past two years the company has received the award for the best trade exhibit. Two large marquees housed a varied selection of general domestic apparatus and agricultural appliances of all the well-known makes, demonstrating the great labour-saver electrical energy can be to the farmer, dairyman, and poultry keeper. There were transportable motors, an oil cake breaker, chaff cutter, water pump and pressure tank, water heater, electrode steam generator, refrigerator, ice-cream freezer, cream separator, butter churn, milk cooler, milking machine, bottle washing, filling and sealing machines, poultry water-vessel warmer, laying house, egg tester, foster mother, hover, incubator, egg-grading machine, poultry plucker, electrically driven clippers, lawn mowers, horticultural forcing frame, and a variety of heating, cooking, cleaning, lighting, and small power devices for the home too numerous to mention. The illustration shows a section of the exhibit where electric sewing was demonstrated.

Australian Electrical Imports

The value of imports of electrical machinery and appliances into Australia during the nine months ended March 31st last was £858,242, as compared with £2,584,983 in the corresponding period of the preceding year.

Recent Contracts

Electroflo Meters Co., Ltd., has secured the order for twelve sets of control instruments, with instrument panels, for the twelve boilers being installed at the Dunston " B " generating station of the Newcastle-upon-Tyne Electric Supply Co., Ltd. The contract includes electrically operated steam and water meters, CO_2 recorders, boiler ratio meters, draught and pressure gauges, &c.

Sir W. G. Armstrong Whitworth & Co., Ltd., Newcastle-on-Tyne, have secured a contract for converting eight Diesel engines and generators weighing 28 tons each into Diesel railcars. The engines are being brought from Zurich, and after conversion will be re-exported to Buenos Aires.

Export orders recently received by the Electric Furnace Co., Ltd., and its subsidiary, the Electric Resistance Furnace Co., Ltd., include furnaces of a variety of types. They are now constructing one 20-ton and two 3-ton Héroult furnaces for the manufacture of special steel and steel castings respectively, the former being supplied with a transformer of 6,000 kVA capacity. A 4-ton Ajax-Northrup high-frequency furnace is now in course of erection in Sweden, while a 6-ton furnace of the same type is being constructed. An order for resistance furnaces for hardening and tempering agricultural tractor parts has also been received, the approximate value being £30,000. This order comprises some of the largest continuous furnaces ever built in this country, and it was obtained in face of severe foreign competition.

Standard Telephones & Cables, Ltd., has received orders from Magnetic & Electrical Alloys, Ltd., for 30,000 lb. of " Permalloy " sheet to be used for transformer stampings for a well-known Midland radio firm.

The Alpha Manufacturing & Electrical Co., Ltd., has received orders for the electrical installations at Dorking Court House and police station, Dorking, and the Crown Road schools, Sutton, for the Surrey County Council.

Some months ago Birmingham Electric Furnaces, Ltd., received an order for thirty-seven electric furnaces for export to Russia. This order has now been completed, and the company informs us that it has now received a still larger order from the same source, the value of the present contract being over £30,000. The furnaces now ordered are for production work in a large tractor factory (the previous furnaces being for the tool room in the same works), and many of them are of types not previously built in this country. They include continuous furnaces of the chain conveyor, belt conveyor, and

driven-roller hearth type, several of them working in conjunction with specially designed conveyor type quench tanks.

Siemens Electric Lamps & Supplies, Ltd., has been appointed by the Royal Mail Steam Packet Co. to supply gas-filled lamps.

A Hotpoint Cooker Development

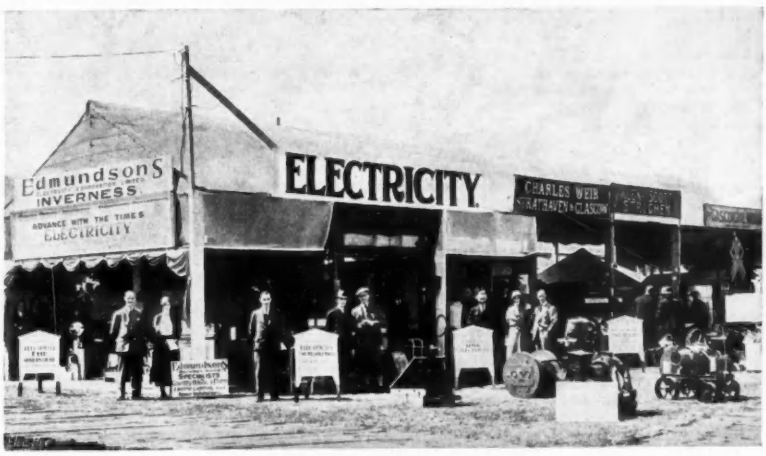
As from to-day (July 1st) the Hotpoint Electric Appliance Co., Ltd., will cease to be the sole distributor of "Falco" electric cookers. The company has made arrangements with the British Thomson-Houston Co., Ltd., for the manufacture of its own cookers, and it is hoped that the factory will be in production early in October.

E.D.A. at the Highland Show

One of the features of the Highland Show at Inverness was the well-planned exhibit organised by the British Electrical Development Association. Following the successful display at the Centenary Show last year at Edinburgh, the Scottish Area Committee of E.D.A. decided to organise another electro-farming exhibit, and active co-operation was obtained from the Inverness Corporation Electricity Department, the Grampian Company, and Messrs. Edmundson's Electricity Corporation of Inverness.

The stand, which occupied a prominent corner site, contained a comprehensive range of farming equipment, such as milking machines, incubators and brooders, horse and sheep clippers, churns and separators, barn machinery, pumps and steam raising plant. A special feature was the variety of portable farm motors on view.

The domestic section, with its range of up-to-date cookers, fires, wash boilers, kettles, irons, toasters, &c., attracted a constant stream of visitors. From the interest which is shown by the Scottish farming community in the possibilities of electrical energy in its various applications, this exhibit promises to become an increasingly important feature of the "Highland."



An E.D.A. exhibit in Scotland

Employment During May

The *Ministry of Labour Gazette* states that there was a substantial increase in the number of insured persons temporarily stopped in the engineering industry, probably due in part to extensions of Whit Week holiday suspensions; the total number unemployed increased from 260,033 to 272,056, and the proportion from 25.9 to 27.1. In the electrical engineering section employment remained moderate, those out of work numbering 15,152, as compared with 15,154 in April; the percentage was 16.4. There were increases both in the electrical cable, wire and lamp manufacturing group, from 15,187 to 15,344 (from 14 to 14.2 per cent), and in the electrical wiring and contracting industry, from 4,392 to 4,588 (from 19.3 to 20.4 per cent.).

Window Displays at Cardiff

During the recent I.M.E.A. Convention at Cardiff the showroom illustrated was temporarily opened for the display of

Attractive "Mazda" and "Santon" displays at Cardiff

"Santon" water heaters and "Mazda" lamps. The window displays attracted a good deal of favourable attention.

Prices of Materials

Messrs. F. Smith & Co. report, June 29th: No change in the prices of silicium bronze wire and electrolytic copper.

Messrs. Edward Till and Co. report, June 29th:—India-rubber, Para fine, no change.

Messrs. James and Shakespeare report, June 29th:—Copper bars (best selected), sheet and rod, no change. English pig lead, £11 5s., 5s. decrease.

New Catalogues and Lists

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Publication No. 7250/5 dealing with switchgear for low and medium pressures up to 650 V.

Wm. Sanders & Co., Falcon Electrical Works, Wednesbury, Lancs.—An illustrated leaflet describing "Sandalux" switches and combined switches and fuses.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.—Leaflet No. L.521, giving particulars of "Mazda" motor-bus lamps.

Electrical Equipment & Carbon Co., Ltd., 107/111, New Oxford Street, W.C.1.—List No. C.3, containing details of "Crosby" type wire rope clips and special fittings for overhead lines.

Rhodes, Brydon & Youatt, Ltd., Waterloo Engineering Works, Gorsey Mount Street, Stockport.—Publication No. 131, describing various types of "Mopump" pumping equipment.

Power Plant Co., Ltd., West Drayton, Middlesex.—A calendar for July containing a supply of graph paper.

S. Lesser & Sons (1928), Ltd., 23-27, Houndsditch, E.C.3.—A leaflet containing details of "Resselbell" radio receivers.

Mond Nickel Co., Ltd., Thames House, Millbank, S.W.1.—A leaflet on "Nickel-iron Alloys in Temperature Control."

Drake & Gorham Wholesale, Ltd., 77, Long Acre, W.C.2.—Pamphlet No. 508, illustrating and describing a wide range of electric clocks.

Crompton Parkinson, Ltd., Guiseley, Leeds.—A leaflet in Spanish indicating the rapid strides made in the sales of the company's motors in the Argentine market since their introduction there five years ago.

Berry's Electric, Ltd., 85-86, Newman Street, Oxford Street, W.1.—A leaflet announcing a reduction in prices of "Masta" and "Viking" switch-fuses.

Valbania, Ltd., Cavendish Engineering Works, Hartington Road, South Lambeth, S.W.8.—An illustrated folder showing a number of attractive modern lighting fittings.

British Insulated Cables, Ltd., Prescot, Lancs.— Catalogue C.1.J. dealing with a.c. meters.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, Kingsway, W.C.2.—A folder relating to "Supreme" hair dryers which are now entirely British made.

British Insulated Cables, Ltd., Prescot, Lancs.—Catalogues dealing with welders and rivet heaters (P.267), paper cables (C.1.A.), and bitumen and trailing cables (C.1.B.).

Kersons Manufacturing Co., Ltd., Minworth, Birmingham.—An illustrated price list (No. 105) of modern electric accessories. Also a folder describing "Woodcock" safety switches.

Nathan & Allen, Ltd., 131, Victoria Street, S.W.1.—Several pamphlets illustrating and describing various types of measuring and testing instruments, &c.

Santon, Ltd., 149-150, Dock Street, Newport, Mon.—A leaflet giving particulars of thermal storage water heaters.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—In our last issue we described publication No. 1490 as dealing with electrolytic precipitation instead of *electrostatic* precipitation.

Brittain's Electric Motor Co., Eastdown Works, Dermody Road, Lewisham, S.E.13.—List No. 127 giving prices and particulars of polyphase induction motors.

Brook Motors, Ltd., Empress Works, Huddersfield.—A folder on Brook "special" motors.

Bankruptcy Proceedings

W. J. Holyoake, electrical engineer, 2, Scott's Mansions, Claremont Hill, Shrewsbury.—Receiving order made June 15th on debtor's own petition. Public examination July 20th at the Shire Hall, Shrewsbury.

R. O. Woodruff, electrical and radio engineer and contractor, 4, Bridge Parade, Godstone Road, Purley.—First meeting to-day (Friday) at 29, Russell Square, W.C. Public examination July 14th at the County Court, Scarbrook Road, Croydon.

F. Lockett, electrical dealer, 45a, Parrs Wood Road, Didsbury, Manchester.—Public examination July 15th at the Court House, Quay Street, Manchester.

H. C. Scholes (Scholes Electric Co.), 37, Albany Road, Chislehurst.—Supplemental dividend of 2d. in the £, payable June 27th at the Official Receiver's office, 280a, High Street, Rochester.

C. Shilvock (trading as G. Shilvock & Son), electrical contractor), 197, Railway Terrace, Rugby.—The first meeting of creditors was held on June 16th at the Official Receiver's Office, 9-11, High Street, Coventry, when the statement of affairs showed liabilities of £421 and assets of £8, leaving a deficiency of £414. The position was attributed to competition, bad trade,

and bad debts. The case, being a summary one, was left in the hands of the Official Receiver as trustee.

G. E. Hughes, electrical engineer, 90, Gibbet Street, Halifax.—The public examination took place at the County Court, Prescott Street, Halifax, when a statement of affairs was submittted which disclosed ranking liabilities of £803, against assets of £104, leaving a deficiency of £699. The debtor attributed his failure to lack of capital, heavy court costs, and general trade depression. The examination was closed.

A. Johnson, electrical and mechanical engineer, 29, Tichborne Road, West Bowling, Bradford.—At this debtor's public examination at Bradford, on June 21st, a statement of affairs was submitted which showed gross liabilities of £187, of which £174 was expected to rank for dividend. The failure was ascribed to shortage of capital and depression in trade. The examination was concluded.

J. Vigon (trading as Modern Electrical Installations), electrical and radio engineer, 355, Commercial Road and lately 85, Greenfield Street, E.—This debtor attended at the London Bankruptcy Court on June 21st for public examination upon accounts showing liabilities of £1,984, against assets of £1,206. The failure was attributed to lack of capital, heavy overhead charges, loss by burglary, and loss on contracts through underestimating. The examination was concluded.

D. C. Bailey, wireless dealer, 22, Doncaster Road, Barnsley.—Receiving order made June 21st on a creditor's petition.

G. F. Gilbert, electrical engineer, 60, Nottingham Road, Nottingham.—Receiving order made June 20th on debtor's own petition.

E. Turner, electrician, 23, High Street, Shaw.—Receiving order made June 21st on debtor's own petition. First meeting to-day (Friday) at the Official Receiver's offices, Byrom Street, Manchester. Public examination July 19th at the Court House, Church Lane, Oldham.

J. T. Lord, electrical engineer and contractor, Commercial Buildings, Oakworth, near Keighley.—Trustee, Mr. J. O. Morris. 12, Duke Street, Bradford, Official Receiver, released June 7th.

W. C. Hannah, electrical engineer, 2, Percy Street, Hull.—Trustee, Mr. J. E. D. Stickney, 37, Scale Lane, Hull, Official Receiver, released June 14th.

F. W. Cassell (F. W. Cassell & Co.), electrician, 164, Park View Road, Welling.—Trustee, Mr. C. J. Pyke, 280A, High Street, Rochester, Official Receiver, released June 7th.

H. Turner, radio and electrical contractor, 20, Battersea Rise, Clapham Common, S.W.—Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C., Official Receiver, released June 14th.

W. Darbyshire, electrical factor and contractor, 65, Towngate, Leyland.—First and final dividend of 3s. 2½d. in the £, payable June 30th, at the Official Receiver's office, 9, Cannon Street, Preston.

Company Liquidations

Marathon, Ltd., manufacturers of electric and other signs, 53-55, Bermondsey Street, S.E.1.—The statutory meeting of creditors was held on June 20th at the Textile Exchange, St. Paul's Churchyard, E.C., when a statement of affairs prepared by Messrs. F. Rowland & Co., 76, Finsbury Pavement, E.C.2, was submitted, which disclosed ranking liabilities of £3,191, due to cash, trade, and creditors for salaries, &c. The total assets amounted to £656, from which had to be deducted preferential claims of £308, leaving net assets of £348, or a deficiency of £2,843. The creditors agreed to the appointment of Mr. Davis as liquidator, with a committee of inspection.

Bond Wholesale Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. P. T. Muggison, Corridor Chambers, Market Place, Leicester.

R. C. Seal & Co., Ltd.—Particulars of claims by July 25th to the liquidator, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

Coniston & District Electric Supply Co., Ltd.—Meeting July 28th at 31, Manor Row, Bradford, to receive an account of the winding-up by the liquidator Mr. A. G. Stringer.

Chilean Electric Tramway & Light Co., Ltd.—Meeting July 25th at 47, Parliament Street, S.W., to receive an account of the winding-up by the liquidator, Mr. J. L. Walsh.

Winding-up Petitions

Hanson Electrical Supplies, Ltd.—A petition for the winding up of this company has been presented to the High Court by Electric Lamp Factors, Ltd., and will be heard in London on July 4th.

Zelco, Ltd.—A petition for the winding-up has been presented to the High Court by Telsen Electric Co., Ltd., and will be heard in London on July 4th.

Dissolutions of Partnerships

Weakford & Maurice, wireless and electrical dealers, 199a, Westgate Road, Newcastle-upon-Tyne.—Messrs. M. Levey and A. Weakford have dissolved partnership. Mr. Weakford will attend to debts and carry on the business.

Turner & Barton, electricians, Orford Avenue, Warrington.—Mr. T. F. Turner and T. Barton have dissolved partnership. Mr. Turner will attend to debts and carry on the business.

Robinson & Sykes, electrical engineers and contractors, Richard Street, Brighouse.—Mr. W. Robinson and Mrs. J. Sykes have dissolved partnership. Mr. Robinson will attend to debts and carry on the business.

E. Dawson & Co., 10, Gray's Inn Road, W.C.—Mr. W. E. Pott and Mr. C. A. Henckel have dissolved partnership. Mr. Pott will carry on the business.

Private Arrangements

E. Nicholls, electrical and radio engineer, 6, Windsor Road, Griffithstown.—The creditors were called together recently when the statement of affairs showed liabilities of £557, due to the trade. After allowing £13 for preferential claims, the net assets were £213, or a deficiency of £344. The creditors decided to confirm the deed of assignment executed recently.

R. Scott (trading as the Direct Wireless Co.), 64 and 83b, Vicar Lane, Leeds.—At the meeting of creditors held on June 24th at Leeds the statement of affairs showed ranking liabilities of £2,208, all due to unsecured creditors. The total assets were £654, and after allowing £228 for preferential claims, the net assets were £426, or a deficiency of £1,782. It was decided that the matter should be dealt with under a deed of assignment, while a committee was also appointed.

Electricity Supply

Lighting, Domestic, Power

Amble (Northumberland).—OVERHEAD LINES.—The Urban District Council has granted an application from the Newcastle-upon-Tyne Electric Supply Co., Ltd., for permission to erect overhead lines at Radcliffe.

Ayr.—OFFER TO PURCHASE UNDERTAKING.—The Town Council is to send representatives to a joint conference with Kilmarnock Town Council and Ayr County Council representatives to discuss an offer by a London firm to purchase the Ayrshire Electricity Board's undertaking.

Blackpool.—AUTUMN ILLUMINATIONS.—The autumn illuminations will this year extend a mile further along the new Promenade and cost over £10,000.

Brighton.—METERING EQUIPMENT.—The Electricity Committee is to purchase metering equipment costing £900 in connection with the supply to the Hove Corporation.

SUPPLY TO PUMPING STATION.—A supply of electricity is to be given to the Balsdean pumping station at a cost of £1,000.

Cheltenham.—MAINS AND SERVICES.—The Electricity Committee has obtained sanction to a loan of £10,000 for mains and services.

Congleton.—ASSISTED WIRING.—The Town Council proposes to apply for sanction to a loan of £3,000 for the assisted wiring scheme.

Eastbourne.—EXTENSIONS.—The Electricity Committee has received sanction to a loan of £25,000 for mains and extensions. Mains extensions are to be carried out at Pevensey Bay at a cost of £620.

DEMONSTRATIONS AT SHOWROOMS.—The Electricity Committee has approved the provision of a demonstration room at the electricity showrooms.

Edgmond (Salop).—A SUPPLY IN OCTOBER.—The West Midlands Joint Electricity Authority has informed the Parish Council that a supply of electricity will be available for the village by October next.

Flodden Field.—NEW OVERHEAD LINE PROPOSAL.—The Central Electricity Board has put forward an alternative proposal for the route of the overhead lines by which the site of the battlefield will be avoided. The Glendale Rural District Council and the County Council have given their approval.

Folkestone.—CORPORATION TO PURCHASE UNDERTAKING.—The Town Council has decided to purchase the electricity undertaking from the Folkestone Electricity Supply Co., Ltd.

Gillingham (Kent).—REQUEST FOR IMPROVED STREET LIGHTING.—The Chamber of Commerce has asked the Corporation to improve the lighting in the High Street and in other shopping thoroughfares, and the borough electrical engineer has been directed to report upon the cost of an improved system.

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee is to lay distributing mains at an estimated cost of £5,378.

PROGRESS DURING MAY.—Under the Electricity Department's scheme 173 houses were wired in May, making a total of 35,780, while the number of hired appliances installed increased to 20,085.

SCHOOL LIGHTING.—The Education Committee recommends the carrying out of electric lighting alterations at twelve schools during the summer vacation.

Ipswich.—CORRECTION.—The paragraphs in our last issue under "Ipswich" should have been headed "Rochdale."

Kirkcudbright.—PROGRESS OF LOCH KEN BARRAGE.—In connection with the scheme of the Galloway Water Power Co. to develop the water power resources of Kirkcudbright and Wigtown, considerable progress has been made with the construction of the Glenlochar sluice gate barrage at the lower end of Loch Ken in Kirkcudbrightshire, where the River Dee emerges from the lake. A coffer dam of steel pilings has been built round half the site of the barrage, provision thus being made for the erection of the piers to take three of the sluice gates, which have been built by Messrs. Glenfield and Kennedy, Ltd., and are being transported bodily by road to Loch Ken. The three gates were lowered with the water actually flowing between the piers. The second half of the work is now in progress, and a saving of several weeks' time is anticipated by this method of construction. The engineers for the scheme are Sir Alexander Gibb and Partners.

Leicester.—YEAR'S WORKING.—A profit of £65,107 is recorded on the past year's operation of the electricity undertaking.

London.—FULHAM.—The accounts of the Electricity Department for the past year show a surplus of £27.553.

PADDINGTON.—The Borough Council is asking the London and Home Counties Joint Electricity Authority to arrange a conference between the Metropolitan Electric Supply Co., Ltd., the Council and the Joint Authority to consider the question of the charges of the company in the Paddington district.

ST. MARYLEBONE.—The Electricity Supply Committee recommends the expenditure of a further £5,000 on the extension of a.c. supplies.

The total revenue of the electricity undertaking last year amounted to £543,258 and the net profit was £693.

HACKNEY.—The Electricity Committee is applying for sanction to a loan of £20,000 for its assisted wiring scheme.

Luton.—LOAN.—The Town Council has applied for sanction to a loan of £33,858 for excess expenditure in connection with extensions, for which loans amounting to £143,300 have been sanctioned.

Machynlleth.—LOCAL SUPPLY SCHEME.—A sum of £4,400 has been subscribed for the formation of a local supply company, and a Special Order is to be applied for.

Morpeth.—OVERHEAD LINES.—The Rural District Council has given sanction to the Newcastle-upon-Tyne Electric Supply Co., Ltd., to erect overhead lines at the Pegswood housing estate and at Whitefield.

North Sunderland.—PROTEST AGAINST HIGH CHARGES.—The ratepayers recently held a meeting to discuss the electricity supply question. It was stated that the local supply company was charging 1s. per kWh for electricity and had refused to make any reduction. The Newcastle-upon-Tyne Electric Supply Co., Ltd., had supplied energy to Embleton and was charging 7d. per kWh and less for business premises. Mr. Pinkney (representing the Newcastle Electric Supply Co.) was asked to urge his company to supply North Sunderland with electricity.

Northern Ireland.—EXTENSION OF ELECTRICITY SCHEME.—It is understood that a number of towns in the counties of Armagh, Tyrone and Down not included in the original programme of electrical extension are now anxious to participate, and their applications are to be dealt with in order of precedence by the Electricity Supply Board.

Ormskirk.—SPECIAL ORDER.—The Ormskirk Electric Supply Co., Ltd., has applied to the Electricity Commissioners for a Special Order providing for (*a*) the repeal of existing Special Orders, (*b*) the annulment of agreements with the Urban District Council, and (*c*) the supply by the company of electricity in part of the urban district of Ormskirk.

Plymouth.—EXTENSIONS.—Cable extensions in eight streets of the city have been authorised, and the Electricity Committee has also decided to apply for sanction to a loan of £5,000 for land and buildings in connection with new sub-stations.

Preston.—THE RIBBLE POWER STATION.—The Electricity Committee proposes to spend £22,000 in connection with the Ribble power station.

Redcar.—REDUCED CHARGES.—The charge for electricity for lighting is to be reduced from 5½d. to 5d. per kWh for slot meter users, and from 4½d. to 4d. for ordinary consumers.

Richmond (Yorkshire).—NO SUPPLY FOR HUDSWELL YET.—The Rural District Council has been notified that the Cleveland and Durham County Electric Power Co. does not intend at present to supply Hudswell Village.

Saffron Walden.—CHEAPER ELECTRICITY.—Electricity for lighting is to be reduced from 9d. to 8d. per kWh.

Skipton.—YEAR'S WORKING.—The Electricity Department made a net profit of £2,631 last year.

Stirling.—YEAR'S WORKING.—The electricity undertaking last year showed a profit of £857.

Stirlingshire.—SUPPLY TO VILLAGES.—The villages of Balfron and Kilearn are to be supplied with electricity shortly. Most of the houses in both places have already been wired.

South Africa.—OVERSEAS TENDERS FOR DURBAN SUPPLIES.—The Durban Corporation Electricity Committee recently passed a resolution that the town treasurer, general storekeeper, and the borough electrical engineer be instructed to report on the advisability of the Council's purchasing goods overseas on a c.i.f. basis, or, alternatively, delivered at the general stores. In a report submitted by the three officials mentioned it is suggested that previous resolutions of the Council should be rescinded, the result of which would be to allow heads of departments to revert to the previous practice of obtaining tenders from overseas where they consider it advantageous to the Town Council.

NEW SCHEME FOR KLERKSDORP.—The Klerksdorp Town Council has decided to proceed with a new electricity scheme for the town.

Southport.—ILLUMINATION SCHEME.—The Town Council is to be asked to approve a scheme of decorative illuminations during August and September.

Swansea.—PULVERISED COAL.—The Corporation has under consideration the question of utilising pulverised anthracite coal duff for firing the boilers at the Tir John North power station, where excavations for the tunnelling to convey the cooling water to and from the King's Dock are now in progress.

Woking.—STREET LIGHTING.—The Urban District Council has installed some 750 G.E.C. "Wembley" lanterns to illuminate thoroughfares in and about the town. They are fitted with asymmetric refractors and each unit is of the totally enclosed type, entirely weatherproof, and free internally from atmospheric effects, such as that caused by fog or grime. Beyond an occasional wipe of the outer globe cleaning of the lanterns is quite unnecessary, and imposes no tax on the maintenance department. The accompanying illustration shows the new lighting at the Square. Mr. Fitzroy Woods, the Council's electrical engineer, was responsible for the scheme, the whole of the street lighting in Woking now being converted to electricity.

The Square at Woking now illuminated electrically by "Wembley" lanterns

Worksop.—EXTENSION SCHEME POSTPONED.—The Town Council has postponed a scheme to supply Whitwell, Hodthorpe, Steetley and Belph with electricity owing to the fact that a firm in the district is already supplying the Whitwell area. An application for a loan of £8,000 has been withdrawn, and the Electricity Commissioners have been asked to extend the Order for a further period of two years.

Traction

Brighton.—PROPOSED DOUBLING OF TRACK.—The Tramways Committee is to apply for consent to the doubling of the track between the Seven Dials and the railway bridge when the work of renewing the track is carried out.

Continental.—SWITZERLAND.—One of the most powerful electric railway locomotives in the world is now in service on the St. Gotthard section of the Swiss Federal Railways. It is of the single-phase type and of 8,800 h.p., its electrical equipment being of Oerlikon manufacture. It is capable of hauling 600-ton express and 750-ton freight trains at speeds of 38.5 and 31 m.p.h. respectively up gradients of 1 in 37. The duties imposed are far more severe than any hitherto specified for electric locomotives. To satisfy the conditions the new locomotive had to be provided with eight driving axles and its length necessitated the body being divided into two; it was therefore decided to adopt a design with two close-coupled halves approximately equal. There are two motors per driving axle, arranged symmetrically in relation to the longitudinal axis. A so-called adhesion augmenter, *i.e.*, a compressed-air cylinder above the middle pony axle, makes it possible to take weight off the latter and transfer it to the driving axles. The two motors of each driving axle are connected in series and the four groups of motors of each section are themselves connected in parallel to the secondary winding of the step-transformer. The neutral point of the latter is earthed. The speed regulation is by connecting the motors to different tappings on the high-voltage winding of the step-transformer; the reason for this is to be able to dimension the switchgear for a higher pressure and, consequently, a much lower current. Electric braking limits the speed to 21.7 m.p.h. and 40.3 m.p.h. on inclines of 1 in 37. Regenerative braking is also capable of bringing the whole train to a standstill, hand and compressed-air brakes being provided in addition. A picture of the new locomotive appears on page 15.

Glasgow.—YEAR'S WORKING.—At a meeting of the Transport Committee last week Mr. P. J. Dollan, the convener, presented the financial statement for the year 1931-32. The figures showed a surplus of £8,936 for the whole undertaking, as compared with £17,207 for 1930-31. The surplus was due entirely to the tramways, since there was a loss of £48,118 on the subway and £41,525 on the buses, besides additional expenditure on superannuation allowances and expenses incurred on repayment charges in connection with suburban systems acquired several years ago. The total revenue amounted to £2,790,660, representing the conveyance of 535,954,427 passengers, as against £2,823,907 and 548,831,615 passengers for the previous year. The convener claimed that had there been no subway and no buses and all the passengers been carried on the trams, there would have been a surplus of over £100,000. In an interview later, Mr. Dollan stated, however, that the Committee recognised that the time might come when trams would have to be replaced by buses and they had built up the system to meet that contingency. They had now some 400 buses in service, and in a few years they expected to have 800 buses and an equal number of trams in operation. Up to the present they had not been able to take off a single

tramcar, but the rail and overhead equipment had not been extended. A report on the proposal to electrify the subway will be available in a few weeks, and it is understood that experiments have been carried out involving the use of self-contained coaches of the Drumm type, as well as of the more orthodox systems.

Leeds.—TRAMWAY EXTENSIONS.—The Town Council is to construct a short tram track along North Lane, Headingley. The Ministry of Transport has sanctioned the scheme and the work has been put in hand.

Leicester.—YEAR'S WORKING.—The Tramways Department showed a profit of £20,530 last year.

London.—THROUGH PICCADILLY TRAINS TO SOUTH HARROW.—The first section of the western extension of the Piccadilly Railway, enabling Piccadilly trains to run through to South Harrow, was opened for public service last Monday. A 5½-minute service of through express trains is now run from Finsbury Park to Acton Town, Ealing Common and over the Harrow branch of the District Railway, which comprises stations at North Ealing, Park Royal, Alperton, Sudbury Town, Sudbury Hill, and South Harrow. A 2½-minute service works between Finsbury Park and Hammersmith, 170 trains running between Finsbury Park and South Harrow daily in each direction. The running time between Piccadilly Circus and South Harrow is 34 minutes, which is a saving of about 10 minutes. The trains are composed of new rolling stock, some of which has been working on the local service on the Harrow line for the past few months. Altogether 275 new cars, embodying increased door space and improved lighting, ventilation and decoration, have been built for the new service.

TRAFFIC SIGNALS.—The Minister of Transport has notified the Metropolitan Borough Councils that the Ministry is prepared to pay 60 per cent. of the cost of installing automatic traffic signals out of the Road Fund, and also to contribute towards their maintenance.

Manchester.—A BUS STOP SIGNAL.—The Transport Department is experimenting with a coloured light signalling device for the use of persons wishing to stop buses.

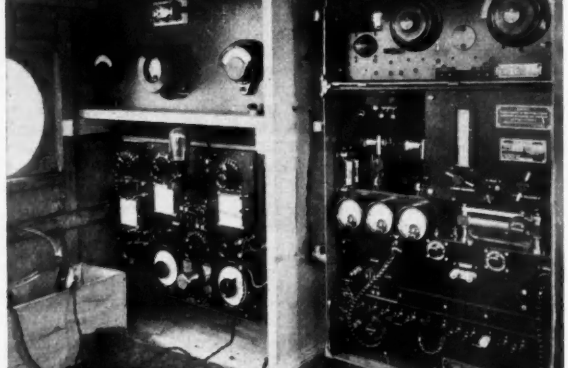
South Africa.—DURBAN.—The Electricity Committee is to review the whole question of the town's future transport and submit recommendations.

Traffic Signals.—NEW INSTALLATIONS.—The installation of automatic traffic signals is proposed at the following places. George Street-Park Lane junction, Croydon (£500); Hebburn-on-Tyne; Stoke Newington (£1,450); Southwark (£820); Manchester (£660); Darlington; Tynemouth; and South Shields.

West Ham.—YEAR'S WORKING.—A net deficit of £4,674 is reported on the working of the Corporation tramways for the year ended March 31st last.

Communications

Australia.—BROADCASTING COMMISSION AS MANUFACTURER.—A conference of representatives of the Electrical Association, the Electrical Manufacturers' Association, and traders, held at Sydney, has protested against the proposal that the Commonwealth Government should compete with private enterprise in the manufacture of radio apparatus. The Radio Manufacturers' Association has pointed out to the Prime Minister that under a clause in the Broadcasting Commission Bill the proposed Commission might manufacture receivers and transmitters, and asked for the elimination of this power.



A mobile Marconi station, installed in a light motor van, which is being used to maintain communication with the Hon. Mrs. Victor Bruce during her attempt on the duration (refuelling) record in the air

WIRELESS LICENCES.—At the end of March the total number of radio receiving licences in use was 350,661, an increase for the month of 3,106, the highest on record.

Canada.—SPECIAL DOMINION DAY BROADCAST.—The celebration of the "birthday" of the Dominion of Canada was to be relayed from London yesterday (Thursday) in the National programme. Through the Canadian National Railway organisation, which maintains a radio representative in London, Canada arranged to take on this occasion the longest direct relay ever received from this country, constituting in duration a record in inter-Empire broadcasting for a single event. It was to begin at 9.25 p.m. and continue until 10.35 p.m. throughout the Dominion. More than twenty thousand miles of telephone wire, stretching from the Atlantic to the Pacific, was used to connect the various networks of stations which serve the nine provinces. The Columbia broadcasting system of America also intended to relay the Prince of Wales's speech only from the short-wave experimental station at Chelmsford, G5SW.

Great Britain.—RADIO EXCHANGES.—Seven firms have applied to the Darlington Town Council for sanction to establish a wireless relay system in the town.

The Improvements Committee of the Truro Corporation is making inquiries into the financial soundness of the system and other matters relating to it.

The Brighton Corporation Lighting Committee is to allow Brighton Radio Circuit, Ltd., to convey its wireless service from south to north Moulsecoomb on the electric light standards at a nominal rental of 1s. per annum for each standard.

India.—WIRELESS IN VILLAGES.—Mr. E. Duncan Smith, wireless consultant to the Government of India, has drafted a scheme for the installation of wireless in villages in the Bombay Presidency. Indian gentlemen have undertaken to provide receiving sets and a European business man has promised to pay a substantial donation to defray part of the cost. It is proposed to choose villages in the centre of well-populated areas and establish listening posts in them. A listening post will consist of a ferro-concrete cubicle about 8 ft. high with a loudspeaker in the roof. The receiving set in each listening post will be of the super-heterodyne seven-valve type and entirely automatic, so that when the operator of the transmitter at Poona switches off, the receiving set will be automatically switched off, and *vice versa*. Transmission will all be done on a 49-metre wavelength.

Irish Free State.—WIRELESS ACHIEVEMENT.—The successful broadcasting of the opening of the Eucharistic Congress last week by the new high-power station at Athlone was the culmination of three months' work in station building which was originally scheduled to take six months. In April work had scarcely begun, but about a month ago Marconi enigneers arrived at the village of Moydrum, Athlone, with the transmitting equipment. Day and night assembly began immediately, and the multitude of delicate adjustments was completed in record time. The transmitter, which is operating on a wavelength of 413 metres, is situated at the geographical centre of Ireland. On its full power of 60 kW it should be well within the reception range of most British listeners, and arrangements have been made whereby its power can be doubled at a later date if required.

London.—RADIO RESEARCH.—The B.B.C. announces that the experimental transmissions which have been radiated for the Department of Scientific and Industrial Research were discontinued on June 25th. These transmissions have been made by a device enabling reception to be effected on Fultograph apparatus and were in connection with an investigation which the Department has been carrying out into the problem of atmospheric disturbances. The Department considers that sufficient data has now been obtained and that no useful purpose will be served by the continuance of these transmissions.

Shanghai.—BEAM WIRELESS STATION.—An agreement has been signed between the Chinese Ministry of Communications and Imperial and International Communications, Ltd., and the Marconi Company for the installation on the outskirts of Shanghai of a beam wireless station for international radio-telegraphic communication, particularly with Great Britain. The Marconi Company is supplying the equipment.—*Reuter* (Shanghai).

South Africa.—TELEGRAPH AND TELEPHONE EXPENDITURE.—The South African loan estimates for the coming year include £4,510 for the completion of the automatic telephone exchanges at Cape Town, Sea Point, and Woodstock, and £3,000 towards the cost of the exchange at Rondebosch. The telegraph and telephone vote is £400,000, which is £169,000 less than last year, reductions having been made in rural extensions, farmers' lines, trunk lines, and apparatus.

United States.—SHORT-WAVE LEGISLATION.—The Amendment Bill now before Congress, which seeks to tax amateur short-wave experimenters, has caused considerable resentment, says *World-Radio*. The Bill further proposes the transference of short-wave affairs from the Department of Commerce to the Federal Radio Commission. There are 604 radio transmitting stations in the U.S.A., of which forty are owned by the States or municipalities, and forty-four by public and private educational institutions.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Angus.—July 8th. County Council. Various works (including electrical) at forty-four houses near Dundee. Master of Works, Municipal Buildings, Forfar (deposit one guinea).

Australia.—SYDNEY.—October 17th. City Council. Four three-circuit power transformers for Pyrmont power station. (A.X. 11378.)*

MELBOURNE.—August 1st. Victorian Electricity Commission. Triple braided copper aerial cable. (A.X. 11376.)*

August 30th. Posts and Telegraph Department. Switchboard cords. (A.X. 11377.)*

August 23rd. Fuses. (A.X. 11386.)*

July 20th. Victorian Government Railways. A.c. power interlocking machine and power point mechanisms. (A.X. 11388.)*

Brighton.—July 14th. Electricity Department. 30,000-kW turbo-alternator, with condensing plant and auxiliaries, and three steam-raising units, combustion equipment, &c. (June 24th.)

Bristol.—July 7th. Electricity Department. Reactors. (June 24th.)

Colombia.—CALI.—Electric passenger lift for the National Government Palace. (A.X. 11370.)*

Dumfries.—July 30th. County Council. L.p. overhead lines and services. (See this issue.)

Falkland.—July 6th. Town Council. Various works (including electrical) at fifty-four houses. Mr. A. D. Haxton, architect, Commercial Road, Leven.

India.—SIMLA.—July 11th. India Stores Department. 31,000 "S-type" inert cells. Director-General, India Stores Department, Belvedere Road, S.E.1 (fee 5s.).

Kelso (Roxburgh).—July 9th. County Council. Electrical work in connection with additions to High School. Mr. G. Sherriff, county clerk, County Offices, Newtown, St. Boswells.

Lanark.—July 4th. County Council. Various works (including electrical) at forty houses at Tannochside and thirty-two houses at Carluke. Mr. P. C. Smith, county housing and town planning engineer, Hamilton.

New Zealand.—WELLINGTON.—July 27th. Post and Telegraph Department. Secondary cells. (A.X. 11381.)*

August 17th. Instrument cords. (A.X. 11382)*

September 13th. Public Works Department. 1,500-kVA transformer for Mangahao power scheme. (A.X. 11383.)*

Plymouth.—July 12th. Electricity Department. Rotary boiler feed pump. (See this issue.)

St. Neots.—July 15th. Urban District Council. Electrically driven pumping plant. Messrs. John Taylor & Sons, Caxton House, Westminster, S.W.1 (deposit £5).

Seaford.—July 9th. Urban District Council. Automatic electric centrifugal pumps, motors, starting equipment, etc., for sewage scheme. U.D.C. surveyor, Council Offices.

South Africa.—JOHANNESBURG.—July 15th. Government Supplies Board. Small motor generator and accumulators. (A.X. 11375.)*

CAPETOWN.—July 27th. Electricity Department. Overhead line material. (A.X. 11387.)*

Stockton-on-Tees.—July 13th. Corporation. Automatic voltage regulator. (See this issue.)

Swansea.—August 3rd. Electricity Department. Generating plant for Tir John North power station. (June 17th.)

West Riding.—July 11th. County Council lighting installation at Hoyland Kirk Balk School. Education officer.

Contracts Closed

Boxhill.—Electricity Committee. Recommended. L.p. cable for six months.—Enfield Cable Works, Ltd.

Cheltenham.—Electricity Committee. Accepted. Cables for twelve months.—Hackbridge Cable Co., Ltd.

Glasgow.—Electricity Committee. Accepted. Plant and appliances required in connection with the change of frequency under the Central Scotland Scheme. Reconditioned meters: Metropolitan-Vickers Electrical Co., Ltd.; Edison-Swan Electrical Co., Ltd.; Ferranti, Ltd.; Chamberlain and Hookham, Ltd. Two new motors (£104): General Electric Co., Ltd.

Transport Committee.—Recommended. Trolley wire: Whitecross Co., Ltd. Cables: Standard Telephones and Cables, Ltd. Alterations to 5,000-kW set: British Thomson-Houston Co., Ltd. Copper bonds: British Insulated Cables, Ltd.

Education Committee.—Accepted. Electrical work at Lambhill Street School extension (£656): D. Henderson. Electrical work at temporary school, Renwick Street (£549): R. J. Sinclair (Glasgow), Ltd.

Grimsby.—Electricity Committee. Recommended. Cables.—Metropolitan Cable Co., Ltd. (£1,522); Johnson & Phillips, Ltd. (£1,344).

Hemel Hempstead.—Rural District Council. Accepted. Installation of electric lighting at houses at Waterside, King's Langley (£69).—Mr. C. E. Wootton.

Hornsey.—Electricity Committee. Recommended. Remote control gear, Muswell Hill station.—A. Reyrolle & Co., Ltd.

Littleton.—Metropolitan Water Board. Accepted. Purchase and installation of an electric de-oiling plant (£154).—Wilson & Perrett, Ltd.

London.—ST. PANCRAS.—Contracts and Stores Committee. Recommended. Cable.—Hackbridge Cable Co., Ltd. (£1,150); Derby Cables, Ltd. (£1,175).

STEPNEY.—Electricity Committee. Recommended. Ordinary and pre-payment meters.—Measurement, Ltd. Meters and demand indicators.—Reason Manufacturing Co., Ltd. Combined meters and demand indicators.—Aron Electricity Meter, Ltd.

Two motor convertors (£10,982).—British Thomson-Houston Co., Ltd.

The lowest tender received was that of the Ateliers de Constructions Electriques de Charleroi, but the Committee states that it has been "advised that facilities would accrue to the Council in accepting the tender of the British firm in, for instance, the testing of the plant as manufactured, and that such acceptance will further have the effect of alleviating unemployment." Tenders for plant were also received from Mather & Platt, Ltd., the General Electric Co., Ltd., Bruce Peebles & Co., Ltd., the Metropolitan-Vickers Electrical Co., Ltd., and the English Electric Co., Ltd.

Manchester.—Education Committee. Accepted. Electrical installation at Mill Street centre.—R. Seddon & Sons. Electrical installation at Ancoats nursery school.—John Collier & Co. (Electrical Engrs.), Ltd.

Forthcoming Events

Overhead Lines Association.—July 1st. Chesham. Summer meeting.

Diesel Engine Users' Association.—Saturday, July 2nd. Summer meeting. Excursion to Southampton, visit to M.V. *Asturias* and presidential address by Mr. C. M. Mayson.

Electrical Power Engineers' Association (*London Technical Group*).—Saturday, July 2nd. Visit to the works of the Hackbridge Electric Construction Co., Ltd., and the Hewittic Electric Co., Ltd., Hersham, Walton-on-Thames.

Association of Supervising Electrical Engineers.—Saturday, July 9th. Visit to Southampton to inspect the *Olympic*.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to receive the name and address of the makers of the following:—

MARVEL dust blower, No. 31016.
GOVERNOR cables.
TURBAX clothes washer (agents).
ORYLUX lamp.
SECOMAC portable electric blower.
Address of the HASLETT HEATING Co.

Notes

The British Standards Institution

At the recent annual general meeting of the Institution, Mr. Maurice Wilson, chairman of the General Council, after welcoming Mr. C. le Maistre, the director, on his return from a seven months' tour of the Dominions, said that imperial co-operation was being developed and effect was being given to the recommendations of the last Imperial Conference. During the year the membership of the Institution had increased by twenty-three per cent. The chairman referred with appreciation to the Government support which was being maintained, in spite of financial stringency. Government Departments all made considerable use of the B.S. Specifications and assisted the Committees in the work of preparing them.

Divisional chairmen reported on their respective activities and Mr. Ll. B. Atkinson, chairman of the Finance Committee, in dealing with the accounts, said that, whilst reductions of subscriptions had to be recorded, the increase in membership had brought about an increase more than sufficient to maintain the income at practically the normal level. A number of economies had been introduced and he expressed the hope that with the wider scope before it the Institution would more than maintain its position and even be able next year to reduce further its adverse balance. At the conclusion of the meeting

Messrs. Roberts, C. Wilson and Railing at the G.E.C. sports meeting. (*See page* 24.)

Mr. le Maistre referred briefly to his seven months' tour of the Dominions, as a result of which co-operation between the British Standards Institution and the Standards Association of Australia would be closer. In New Zealand a central organisation had been set up, and in Canada it was anticipated that a national standards body would grow out of the Canadian Engineering Standards Association. He urged British manufacturers to study more closely the requirements of the Dominions.

The meeting was followed by a luncheon, at which prominent guests and about 210 members of Council and Committees were present.

Electricity, Gas, and Rural Amenities

A tribute is paid to the Central Electricity Board for the care which it has shown in selecting the route for the primary transmission lines in a "Survey of the County of Devon," which has been published this week for the Devon Branch of the Council for the Preservation of Rural England.

"Landowners have been consulted by the responsible engineers so that the skyline and shooting coverts will be avoided wherever practicable. These transmission lines, supported by steel towers, convey a current at 132,000 V, and it has, so far, been found impossible to bury and insulate the wires effectively. For the present, therefore, the tall towers will inevitably alter the appearance of the landscape, but they are not likely to be a more serious disfigurement than the existing mass of Swedish timber poles that carry the Post Office and telegraph wires which are ubiquitous and intrusive in the rural scene."

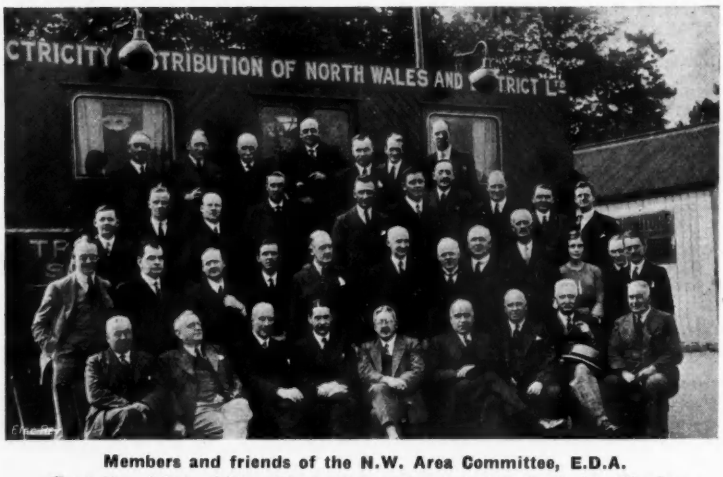
The Report emphasises that the beauty of the Devon landscape depends largely on the prevention of sporadic building development. While it is admitted that some sacrifice of beauty must be suffered in the interests of industrial development, those responsible for the gas-works erected between Torquay and Paignton are severely criticised; the site on the sea-front of Devon's finest bay for gas-works is condemned. The selection of this site is said to be an "initial and fatal mistake."

The Survey, for which Lord Astor, Lord Fortescue, and Lord Mildmay, Lord Lieutenant of the County, are largely responsible, also deals with the new extension to the gas-works, and states "it is most desirable that the whole of this commercial undertaking, which is a serious disfigurement to the bay, should be removed to a less conspicuous site when possible, as this would ultimately prove an immense improvement to Tor Bay."

Inauguration of Hackney Extensions

The extensions to the Hackney electricity undertaking, a description of which was given in our issue of May 27th, p. 764, were formally inaugurated by Prince George on June 23rd. In pressing the switch which started the new 30,000-kW set, the Prince said the extensions were typical of the progress of a great British industry. Within half a century we had passed from a non-electric age to an almost all-electric age. The number of consumers in this country had advanced during the past twelve years from 1,000,000 to over 4,000,000, and despite severe trade depression that advance had been unbroken. The increased demand for electricity for domestic use had counterbalanced the falling off in the industrial demand. It was difficult to say which aspect was the more important, the industrial or the domestic. He hoped that the new machinery would open a fresh chapter in the prosperity of the undertaking and its usefulness to all classes of the community.

The chairman of the Electricity Committee (Ald. W. J. Stapleton) said that the undertaking had been in existence for thirty-one years, and during the whole of that period had been under the control of Mr. L. L. Robinson, the borough electrical engineer. At the conclusion of the ceremony the Prince inspected the works. Pictures appear on page 13.



Members and friends of the N.W. Area Committee, E.D.A.

Front Row (left to right): Ald. J. Marlow (Oswestry), Ald. E. Hughes (Wrexham), Messrs. C. D. Taite, vice-chairman (Lancashire Elec. Power Co.), G. K. Paton (North Wales Power Co.), S. E. Britton, chairman (Chester), L. Romero (Salford), J. H. Farthing (G.E.C.), W. H. Clift (B.I. Cables), H. C. Hazel (E.C.A.). *Second Row:* Messrs. F. G. Southworth (Holywell), J. W. Williams (Wrexham), Councillor Rubbra (Connahs Quays), Messrs. J. Peters (Connahs Quay), L. A. O'Brien (E.W.F.), H. C. Lamb (Manchester), F. L. Ogden (Oldham), P. J. Robinson (Liverpool), J. F. Simpson (Preston), Miss Lane (North Wales Power Co.), Messrs. H. Wilson (showroom staff), H. Barber (builder of the showroom). *Third Row:* Messrs. E. N. Jones (E.C.A. Wrexham), S. Thornton (E.C.A., Wrexham), H. A. Pryor (Siemens), H. W. Scutts (E.C.A., Manchester), C. Derham (Ediswan Co.), G. M. Daniels (North Wales Power Co.), W. Fennell (Mid-Cheshire Elec. Supply Co.), T. K. Fell (Jackson Elec. Stove Co.), Councillor T. E. Bennett (Hawarden), Councillor R. Mathewson (Chester). *Back Row:* Messrs. H. W. Edwards (Oswestry), R. C. Hawkins (E.D.A.), Councillor Reney (Connahs Quay), A. J. Richardson (Hawarden), G. E. Barrett (Electricity Distribution of North Wales), R. Baxendale (Electricity Distribution of North Wales), C. P. Southwood (Liverpool).

E.D.A. in the North-West

The North-West Area Committee of the Electrical Development Association which usually holds its meetings in Manchester made an unusual departure by holding its last meeting at the travelling showroom of the Electricity Distribution of North Wales and District, Ltd., then at Rossett. The object of holding this meeting away from headquarters was to endeavour to stimulate further interest in the Association's activities among undertakings in North Wales and South Cheshire. The final proceedings were thrown open to visitors, and a very useful interchange of ideas resulted. The committee and visitors were afterwards entertained to tea by the North Wales Power Co.

Machine Cut Gears

The new British Standard Specification for machine-cut helical and straight-spur gearing presents information on the design and strength of industrial gears in a form immediately suitable for the design of gears and the solution of gear problems, and deals with the intermittent rating of gears which normally are subjected to varying loads, overloads, and periods of rest. The specification deals with machine-cut gears connecting parallel shafts, the teeth being either straight, single or double helical, and of the 20 deg. full-depth involute system (with a working height of twice the module) of the following classes: (a) precision ground or cut gears for peripheral speeds exceeding 2,000 ft. per min.; (b) high-class cut gears for peripheral speeds between 750 and 3,000 ft. per min.; and (c) commercial cut gears suitable for peripheral speeds below 1,200 ft. per min. Copies of this specification (B.S.S. No. 436-1932) may be obtained from the British Standards Institution, Publications Department, 28, Victoria Street, Westminster, London, S.W.1, price 5s. 6d. post free.

At the E.C.A. Conference, Southport: Mr. E. T. Lawson, Mr. A. E. Iliffe (Benjamin Electric), Messrs. A. O. and A. G. Bruty (Dublin), Mrs. Bruty and Miss Bruty

Overseas Members of the I.E.E.

A conversazione of overseas members of the Institution of Electrical Engineers was held on June 22nd at the Institution Building, Savoy Place, London, W.C.2. After a reception by the President and Council, short addresses were given by Sir Archibald Page on "The Grid," by Sir Thomas F. Purves on "Transatlantic Telephony," and by Mr. N. Ashbridge on "Broadcasting To-day." A reunion in the library concluded the function.

Educational

Northampton Polytechnic Institute, St. John Street, E.C.1.—Particulars are now available of courses in mechanical, civil, aeronautical and electrical engineering. (See our advertisement pages to-day.)

Appointments Vacant

Female cook demonstrator for Manchester Electricity Department. (See our advertisement pages to-day.)

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. H. Gyles, A.M.I.E.E., chief distribution engineer to the Durban Corporation Electricity Department, has been appointed assistant borough electrical engineer as from August 1st. He will succeed **Mr. E. Poole, A.M.I.E.E.,** who is shortly due to retire from that position. The retirement of **Mr. John Roberts, M.I.E.E.,** borough electrical engineer of Durban, after 35 years' service, takes effect in December next, and it will be remembered that a successor was recently advertised for at £1,355, rising by annual increments to £1,581 per annum. The successful applicant is required to take up his duties on November 1st.

Mr. E. Poole, assistant borough electrical engineer at Durban, who is retiring

Mr. R. I. Bagnall, who has been in charge of the Transformer Department of the Foster Engineering Company, Ltd., at Wimbledon, for twenty-five years, has now been elected to the board of directors. **Mr. A. J. Sturgeon,** sales manager, who has been with the company twenty-one years, has also been elected a director.

Mr. F. M. Long, who has retired from the position of city electrical engineer at Norwich

Mr. F. M. Long, city electrical engineer to Norwich Corporation, has retired from that position. He went to Norwich forty years ago, and in 1892 was appointed by the Norwich Electricity Co. as resident engineer to supervise the erection of the Duke Street works and the laying of mains in the city. Later he collaborated with Mr. J. H. Rider, consulting engineer, in the design and erection of the first part of the Thorpe power station. He has served on the Council of the I.M.E.A. for many years, and in 1917 was president of the Association. On June 24th a farewell smoking concert was held in St. Andrew's Hall, Norwich, when Mr. H. S. E. Austin, deputy city engineer, presented him with a radio-gramophone and records on behalf of the staff of the Electricity Department. Mr. Long, in expressing his thanks for the gift, recalled his many experiences during the past forty years. A tribute was also paid to him by Mr. V. A. Pask, who succeeds him as city electrical engineer.

Mr. **George Willock,** the author of the article on the Trollhättan scheme which appears on page 4 of this issue, served his apprenticeship with Messrs. Glenfield & Kennedy, Ltd., Kilmarnock. In 1914 he joined Messrs. Boving & Co. as a pump designer and in the following year was sent by them to Verkstaden Kristinehamn, Sweden. In 1918 he transferred to the Aktiebolaget Finshyttan, and in 1929 was appointed assistant sales manager to Messrs. Nydqvist and Holm A.-B., Trollhättan. Mr. Willock's department handles the sale of water turbines, Diesel engines, pumps, &c., and he is therefore closely in touch with the scheme which he describes.

Mr. G. Willock, author of the article on the Trollhätten power station in this issue

A considerable increase in the membership of the Birmingham branch of the Electrical Contractors' Association is announced. The officers elected at the recent annual meeting were **Mr. S. Dagnall,** chairman; Mr. H. Mountford, vice-chairman; Mr. S. N. Watkins, hon. treasurer; and Mr. H. Keeling, branch secretary.

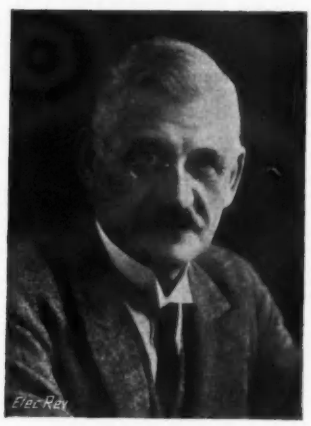
Mr. P. V. Brittlebank has been appointed sales manager of Messrs. Johnson & Phillips, Ltd., with headquarters at the company's London premises, Columbia House, Aldwych. Mr. Brittlebank has been connected with the company's sales organisation for nearly twenty years, and for the last fourteen years has been manager of its Birmingham branch. **Mr. D. G. Rodger,** who has been with the company since 1906, for the last twelve years on publicity and other sales work, has been appointed assistant sales manager at the Charlton Works.

Mr. T. S. Parkinson was recently presented by the staff and employés of the Blackburn Electricity Department with an electric table lamp and an electric clock as a token of esteem and good wishes on his taking up of the position as distribution superintendent with St. Helen's Electricity Department. Mr. Parkinson in turn presented the Sports and Social Club of the undertaking with a silver rose bowl to be competed for annually by the swimming section. The chairman of the Electricity Committee presented the works football team with gold medals as winners of the Birtwistle Cup.

Mr. R. S. J. Spilsbury has been elected chairman of the Meter and Instrument Section of the Institution of Electrical Engineers. The ordinary members of the committee are Mr. T. S. Andrew, Mr. G. A. Cheetham, Dr. C. V. Drysdale, Mr. F. A. East, Mr. W. Holmes, Mr. O. Howarth, Mr. F. C. Knowles, Mr. W. Lawson, Prof. J. T. MacGregor-Morris, Mr. F. E. J. Ockenden, Dr. E. H. Rayner, Mr. B. A. Robinson, and Mr. E. E. Sharp.

Mr. W. Walker, who has been manager of the Nottingham branch of Messrs. Mayall & Co., Ltd., for the last four years, has been elected a director of the company.

Mr. Frederick Samuelson, of the British Thomson-Houston Co., Ltd., has been honoured by the King of Sweden, who has conferred on him the Royal Order of Nordstiernan. Mr. Samuelson has been in the service of the British Thomson-Houston Co. for over thirty-five years, and has been in charge of the Turbine Department ever since it was started in 1903. Previous to this he worked with Sir Hiram Maxim on his quick-firing gun and flying machine. In connection with the design of steam turbines, Mr. Samuelson's reputation is world wide, and a few years ago the Detroit Edison Co. ordered a 10,000-kW turbine to run at 3,600 r.p.m. with steam at 1,000°F.—a much higher total temperature than any that had hitherto been employed in commercial services—to be constructed by the B.T.-H. Co. at Rugby, under his personal supervision.



Mr. F. Samuelson

Mr. Norman Boydell, former senior assistant distributing engineer at Bedford, has been appointed assistant mains superintendent at Blackburn.

Mr. H. Thomas, who for the past two years has been with the Automatic Electric Co., Ltd., has taken up the position of electrical engineer with the Colombo Commercial Co., of Ceylon.

Mr. T. Stirk, traffic superintendent to the Bradford City Tramways Department, is retiring owing to ill-health after 34 years' service

Obituary

Mr. David James.—Mr. David James, J.P., of Pendine, West Cross, who passed away rather suddenly last week, was until March last managing director of the South Wales Transport Co., Ltd., and the Swansea Improvements and Tramways Co. Mr. James, who was sixty-three years of age and seemed to be improving in health since his withdrawal from business owing to his illness, was intimately associated with Mr. C. G. Tegetmeier, the chairman, for thirty years. He retained a seat on the board. Fifty-two years ago he commenced in a humble capacity with the Swansea Tramways Co., of which, with the Mumbles Railway, he became general manager some thirty-three years ago.

Mr. T. Gillette, head electrical engineer to the Harton Coal Company, Ltd., collapsed and died at Boldom Colliery, Durham, on June 24th, while engaged in investigating a fused cable in the Grange district. He had been employed by the company for many years and resided at South Shields.

Mr. E. R. Carter.—We regret to record that Mr. E. R. Carter, London representative of Messrs. W. T. Glover & Co., Ltd., for thirty-four years, passed away on June 25th, aged sixty-nine.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Corey, Parsons & Co., Ltd.—Private company. Registered June 25th. Capital, £1,500 in 500 6 per cent. cumulative preference and 1,000 ordinary shares of £1 each. Objects: To carry on the business of manufacturers, agents for and dealers in wireless transmitting, receiving and television sets and instruments, gramophones, electrical and mechanical clocks, &c. The directors are: E. Parsons (chairman) and R. E. Parsons, both of "Bransby," Thames Ditton, Surrey; A. W. Corey, 201, Kent House Road, Beckenham, Kent; and D. W. Sayer, 26, Hayne Road, Beckenham, Kent. Registered office: Winchester Works, 303, Sumner Road, Peckham, S.E.15.

Synclocks, Ltd.—Private company. Registered June 24th. Capital £100 in £1 shares. Objects: To acquire the business of manufacturers of "Synclock" electric motors in all its forms, together with the goodwill and assets, including the trade mark or name "Synclock," and to adopt an agreement with Everett, Edgcumbe & Co., Ltd. The directors are:—K. Edgcumbe, Aldenham Grange, Watford; E. I. Everett, Cooden, Bexhill-on-Sea; and P. Hamilton, 21, Marlborough Road, N.W.8 (all directors of Everett, Edgcumbe & Co., Ltd.). Registered office: Colindale Works, Hendon, N.W.9.

J. Sharp & Co. (Prestwich), Ltd.—Private company. Registered June 16th. Capital £1,000 in £1 shares. Objects: To acquire the business of an electrician and wireless apparatus dealer now carried on by J. Sharp at 405, Bury New Road, Prestwich, Manchester, as "J. Sharp & Co." The permanent directors are:—J. Sharp, 405, Bury New Road, Prestwich, near Manchester; and G. K. Pemberton, 44, Claremont Road, Birkdale, Southport. Registered office: 405, Bury New Road, Prestwich, near Manchester.

Allbright Electric Co., Ltd.—Private company. Registered June 15th. Capital £1,000 in £1 shares. Objects: To carry on the business of dealers in all kinds of electrical fittings and equipment, particularly pocket and other portable lamps, &c. The subscribers are:—F. Neuburger, 28, Clifton Gardens, W.9; W. Marshall, 182, Baron Road, Chadwell Heath, Essex.

F. S. Mann, Ltd.—Private company. Registered June 20th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and wireless apparatus, gramophones, &c. The first directors are: S. H. Hester and J. S. C. Hester, both of Southlawn, Hawthorne Road, Bickley, and F. S. Mann, 60, Lamont Road, Chelsea, S.W.10. Registered office: 27, Bangalore Street, Putney, S.W.15.

A.B. Electric Co., Ltd.—Private company. Registered June 23rd. Capital £5,000 in £1 shares (3,000 7 per cent. cumulative preference and 2,000 ordinary). Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in electric lighting fittings and accessories, and electrical and wireless apparatus, &c. The directors are: H. Boyne, Mrs. Margaret L. Boyne, both of 28, Poliards Hill South, Norbury, S.W.16, and H. Kelly, address not stated. Solicitor: G. F. Bolam, 12, West Street, Gateshead.

Harold F. Ward, Ltd.—Private company. Registered June 21st. Capital £2,000 in £1 shares (250 7 per cent. preferred and 1,750 ordinary). Objects: To acquire the business of an electrical contractor, electrical and mechanical engineer and dealer in electrical apparatus carried on by H. F. Ward at 1112, Stratford Road, Hall Green, Birmingham. The first directors are: H. F. Ward, 67, School Road, Hall Green, Birmingham, and H. R. Ward, 1112, Stratford Road, Hall Green, Birmingham. Secretary: C. W. Kimbell. Registered office: 1112, Stratford Road, Hall Green, Birmingham.

Wireohms, Ltd.—Private company. Registered June 22nd. Capital £2,000 in £1 shares. Objects: To carry on the business of electricians, manufacturers of and dealers in electrical apparatus, appliances and machinery, wire drawers, conduit manufacturers, &c. The subscribers are: A. J. E. Behm, 20, Broughton Drive, Wollaton Park, Nottingham, and G. H. M. Thompson, Lastingham, York. Secretary: S. Hill. Registered office: 17, Castle Gate, Nottingham.

J. Wesley Evans & Son, Ltd.—Private company. Registered June 22nd. Capital £1,000 in £1 shares. Objects: To carry on the business of electrical engineers, electricians, mechanical engineers, workers of and dealers in electrical and wireless apparatus, &c. The permanent directors are: J. W. Evans and C. W. Evans, both of 16, Bosworth Road, Skewen, near Neath, Glam. Secretary: F. Jennings. Registered office: 16, Bosworth Road, Skewen, near Neath, Glam.

East Midland Electrical Co., Ltd.—Private company. Registered June 17th. Capital, £1,500 in £1 shares. Objects: To acquire the business of an electrical engineer and magneto and motor repairer and dealer carried on by Florrie Leech at St. Rumbold Street, Lincoln, as the "East Midland Electrical Company." The directors are: Florrie Leech, 19, Yarboro Crescent, Lincoln; S. W. Knight and H. B. Edwards, both of 61, South Park, Lincoln. Secretary: J. F. Hipwood. Solicitors: Porter & Kitchen, 191, High Street, Lincoln.

North London Cleaner Co., Ltd.—Private company. Registered June 14th. Capital £300 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and dealers in wireless apparatus, electrical fittings and accessories, electrical and mechanical engineers, &c. The subscribers are:—L. W. Gooding, 27, Penn Road, Holloway, N.7; and E. G. F. Cartwright, 21, York Buildings, Adelphi, W.C.2. L. W. Gooding is sole director.

Electrical Service & Supply Co., Ltd.—Private company. Registered June 16th. Capital £500 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in wireless apparatus, &c. The permanent directors are:—F. Lidyard, 60, George Street, Pontypool; and W. H. Hobbs, 45, King Street, Cwmdare, Aberdare. Registered office: 89, London Road, Leicester.

Returns of Electrical Companies

Crompton Parkinson, Ltd.—Capital, £826,769 in 200,000 1st preference and 326,769 2nd preference shares of £1 and 600,000 ordinary and 600,000 "A" ordinary shares of 5s. each. Return dated January 1st, 1932. 170,725 1st preference, 326,769 2nd preference, 600,000 ordinary, and 163,010 "A" ordinary shares taken up. £398,505 12s. 8d. paid (being £1 per share on 250,007 2nd preference and 6,965 1st preference, 7s. 6d. on 133,760 1st preference and 5s. on 200,000 ordinary and 163,010 "A" ordinary shares, including £621 2s. 8d. paid on forfeited shares). £290,362 considered as paid (being £1 on 30,000 1st preference and 76,762 2nd preference, 5s. on 400,000 ordinary and 12s. 6d. on 133,760 1st preference shares). Mortgages and charges, nil.

General Accessories Co., Ltd.—Capital, £3,000 in 1,580 6 per cent. preference, 920 5 per cent. preference, and 500 ordinary shares of £1 each. Return dated January 13th, 1932. All shares taken up. £1,580 paid on 1,580 6 per cent. preference shares. £1,420 considered as paid on the remainder. Mortgages and charges, £3,000.

H. W. Teeten, Ltd.—Capital £4,000 in £1 shares. Return dated November 20th, 1931 (filed March 31st, 1932). 3,730 shares taken up. £1,539 paid. £2,191 considered as paid. Mortgages and charges, nil.

S. Rogers & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 11th, 1932. All shares taken up. £660 paid. Mortgages and charges, nil.

Hart Bros. Electrical Manufacturing Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1931. 4,474 shares taken up. £4,474 paid. Mortgages and charges, £4,500.

R. A. Poole (London), Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1931. All shares taken up. £10 paid. £990 considered as paid. Mortgages and charges, nil.

Egyptian Power Syndicate, Ltd.—Capital, £10,000 in £1 shares. Return dated December 31st, 1931 (filed January 21st, 1932). 2 shares taken up. £2 paid. Mortgages and charges, nil.

Thermo Path Co., Ltd.—Capital, £3,260 in 3,069 preference shares of £1, and 3,820 ordinary shares of 1s. each. Return dated January 1st, 1932. All shares taken up. £3,114 paid on 3,069 preference and 900 ordinary shares. £146 considered as paid on 2,920 ordinary shares. Mortgages and charges, nil.

Lincoln Wireless Co., Ltd.—Capital, £1,200 in £1 shares. Return dated November 16th, 1931 (filed January 1st, 1932). 700 shares taken up. £700 paid. Mortgages and charges, nil.

East Sussex Wiring Co., Ltd.—Capital, £3,000 in £1 shares. Return dated February 4th, 1932. 2,450 shares taken up. £2,450 paid. Mortgages and charges, nil.

Sifam Electrical Instrument Co., Ltd.—Particulars filed of £2,000 debentures, authorised June 7th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Almeida Accumulators, Ltd.—Debenture dated June 8th, to secure £3,000, charged on the company's rights and interests in a contract dated October 13th, 1927, and agreements supplemental thereto, and the company's undertaking and other property, including uncalled capital, if any. Holders: Telegraph Construction & Maintenance Company, Ltd., 38, Old Broad Street, E.C.

New Armature Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1931. 745 shares taken up. £745 paid. Mortgages and charges, nil.

Ferron Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1931. 2 shares taken up. £2 paid. Mortgages and charges, nil.

Ubique Manufacturing Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1931. All shares taken up. £352 paid. £648 considered as paid. Mortgages and charges, nil.

Patent Switch & Fuse Indicator Co., Ltd.—Capital £2,000 in £1 shares. Return dated April 18th, 1932. 1,530 shares taken up. £830 paid. £700 considered as paid. Mortgages and charges, nil.

Maitland & Co. (Manchester), Ltd.—Capital £3,000 in £1 shares. Return dated March 30th, 1931 (filed May 2nd, 1932). All shares taken up. £2 paid. £2,998 considered as paid. Mortgages and charges, nil.

Brookhirst Switchgear, Ltd.—Capital, £550,000 in 100,000 redeemable preference and 450,000 ordinary shares of £1 each. Return dated January 5th, 1932. 126,002 ordinary shares taken up. £30,502 paid. £95,500 considered as paid. Mortgages and charges, £25,000.

John Collier & Co. (Electrical Engineers), Ltd.—Capital, £20,000 in 12,000 "A" and 8,000 "B" shares of £1 each. Return dated January 7th, 1932. All shares taken up. £2 paid. £19,998 considered as paid. Mortgages and charges, nil.

Wellingborough Electric Supply Co., Ltd.—Capital, £50,000 in £10 shares. Return dated April 26th, 1932. All shares taken up. £50,000 paid. Mortgages and charges, £30,000.

Electric Sign Co., Ltd.—Capital, £5,000 in £1 shares. Return dated November 14th, 1931 (filed April 14th, 1932). 2,000 shares taken up. £1,000 paid. £1,000 considered as paid. Mortgages and charges, nil.

Empson Electrical Engineering Co., Ltd.—Capital, £2,000 in £1 shares. Return dated April 26th, 1932. All shares taken up. £500 paid. £1,500 considered as paid. Mortgages and charges, nil.

John Lightfoot, Ltd.—Capital, £10,000 in £1 shares. Return dated March 21st, 1931. 3,600 shares taken up. £3,600 paid. Mortgages and charges, nil.

City Notes

Ward & Goldstone, Ltd.—The annual meeting was held on June 21st, Mr. M. H. Goldstone presiding. Before dealing with the business of the meeting the chairman referred to the death of Mr. J. H. Ward, one of the founders of the company. Three new directors, Messrs. F. W. Clark, S. Goldstone, and A. Webb had been added to the board. In submitting the report and accounts the chairman said that their confidence in the future was such that they were installing a duplicate plant to deal with their moulded components, and additional machinery to increase their output of insulated wires and cables. Although trade during the period reviewed became progressively more difficult, and in spite of falling prices and powerful competition, they had increased their turnover; to attain this the output had had to be augmented to a very substantial extent. The results were not fully reflected in the profits by reason of the necessity to provide from revenue for the losses sustained by the continuous falls in raw materials, and little benefits from the expenditure incurred on extensions and plant could accrue, as most of these additions and extensions were not in operation at the close of the year. Though the distribution on the ordinary shares was 7 per cent., they had actually earned a sum equivalent to about 12 per cent. The building extensions and increase of plant and machinery should be in full operation for the early autumn, when, usually, their busy season commenced. Despite the adverse world conditions ruling, their belief in the future of the company was confidently maintained.

The Lisbon Electric Tramways Co., Ltd., held its annual meeting on June 22nd, when Mr. S. H. Pollen (chairman), who presided, in presenting the report and accounts, said a diminution in traffic revenue took place during the year under review, the number of passengers carried being 121,592,852, as against 125,002,462 in 1930, and the receipts 72,958 centos, compared with 75,517 centos. The rate of exchange had been officially stabilised, and the effect of this was to reduce the sterling value of the escudo. The departure by this country from the gold standard increased the cost of any supplies that had to be purchased abroad. Their undertaking constituted the most important single industrial enterprise in Lisbon from the point of view of the number of employés dependent on its existence, the total number employed being nearly 3,200, while the city's share of their gross receipts amounted last year to £52,000. Lisbon had undergone, and was still undergoing, a period of great changes and improvements. New avenues were being constructed, and in some cases serious and costly track alterations might be entailed on the company. There was a danger that proposals now being considered might seriously interfere with their essential buildings, equipment, and yards, but they were confident that the powers that be would hesitate before handicapping a concern which was a great employer of local labour. The falling off in traffic continued in the current year, and no marked improvement was likely to take place until the present general depression disappeared.

W. T. Henley's Telegraph Works Co., Ltd., reports a profit of £328,664 for the year ended March 31st last, as against £349,089 in the preceding year. After deducting debenture interest, &c., and adding £567,187 brought in there is a total of £827,470 available. Income tax absorbs £15,974 and reserve again receives £50,000. It is proposed to pay a final ordinary dividend of 2s. 6d. per share, less tax, making 4s. for the year, plus a bonus of 2s. per share, leaving £557,496 to be carried forward. The results are considered satisfactory. Conditions of exchange throughout the world have rendered it difficult to transact business abroad. Considerable sums of money still remain at the Overseas branches of the company, and provision has been made to meet any probable loss which may occur in respect of these amounts. Henley's Tyre and Rubber Co., Ltd., made a satisfactory profit.

The Metropolitan Railway Co. is to hold an extraordinary meeting on July 14th, when the terms which have been provisionally arranged under which the Metropolitan Railway will be absorbed in the new combination under the London Passenger Transport Bill will be submitted to consolidated and preference stockholders. Holders of debenture and preference stocks will exchange their stocks for stock of the New Transport Board. For each £100 of Metropolitan ordinary stock holders will receive £67 10s. of London Transport "C" stock, entitled for two years to a dividend of 5 per cent., and subsequently to a standard rate of 5½ per cent., with conditional rights to a maximum of 6 per cent. Stockholders are offered as an alternative, a guarantee of 3½ per cent. for fifteen years, and 3 per cent. for a further ten years.

L. M. Ericsson Telephone Co.—A *Reuter* message from Stockholm states that the company shows a loss for 1931, after allowing for depreciation, of 22,700,000 kr. The loss absorbs the reserve fund of 10,100,000 kr., and the board proposes to carry over the balance. The loss is due to engagements connected with Kreuger & Toll, and the board proposes to meet them by establishing a guarantee fund of 20,000,000 kr.

It was hoped to submit to a general meeting to be held yesterday a proposal for the company's future following negotiations between the company and creditors and other interested parties.

Tube Investments, Ltd., held an extraordinary meeting on June 22nd when it was decided to increase the capital to £3,000,268 by the creation of 18,000 additional 7 per cent. cumulative "B" preference shares and 9,000 additional ordinary shares of £1 each, in order to carry through the amalgamation scheme with the Stella Conduits Co. by the purchase of the whole of its issued share capital.

Berry's Electric (1928), Ltd., reports a trading profit for the year ended March 31st last of £10,886, as compared with £24,730 in the preceding year, to which is added £1,788 brought in, making £12,674. After deducting directors' fees, income tax, and interest on notes, there is a balance of £1,264. A sum of £1,429 has been placed to reserve for leasehold premises, leaving a debit of £165 to be carried forward.

The Telegraph Construction & Maintenance Co., Ltd., held an extraordinary general meeting on June 24th, when resolutions were passed reducing the capital from £896,400 to £373,500 and sub-dividing the resulting £5 shares into five ordinary shares of £1 each. It is proposed, as and when the reduction of capital is made effective, to return in cash to the shareholders £7 per share.

E. K. Cole, Ltd., report a trading profit for the year ended January 31st last of £141,443, as against £121,188 in the preceding year. After adding £7,001 brought in, it is proposed to set aside £7,238 for depreciation, to write off the expenses of the issue of capital (£20,044), and to place £20,000 to reserve. The ordinary dividend on the enlarged capital is 40 per cent., and £20,542 is carried forward.

Edmundson's Electricity Corporation, Ltd., reports a net profit for the year ended March 31st last of £213,138, as against £220,281 in the preceding year. Reserves receives £15,000 (against £20,000), and the ordinary dividend is maintained at 7 per cent., the carry-forward being £21,683.

Kolster-Brandes, Ltd., reports a net profit of £121,468 for the year ended February 29th last, and after adding a balance brought in and deducting all charges, &c., there is a total of £123,611; this has been disposed of as follows: Income tax, £35,000; contingencies reserve, £25,000; carried forward, £63,611.

The St. James' & Pall Mall Electric Light Co., Ltd., has announced an interim dividend of 8.4d. per share on the ordinary shares.

The Palestine Electric Corporation, Ltd., reports a credit balance for 1931 of £P.20.328,961, from which £P.16,000 has been written off as part of cost of repairs to the Jordan works, leaving £P.4,328,961 to be carried forward. The sales of electricity rose from 5,500,976 to 8,707,917 kW, and the gross revenue from £P.110,747 to £P.139,673.

Greenwood & Batley, Ltd., report a profit for the year ended March 31st last of £11,918 (against £17,320 in 1930-31), to which is added £9,174 brought in and £5,000 transferred from provision for contingencies, making £26,093. As announced in our last issue, the ordinary dividend is 2½ per cent. (against 5 per cent.), and £4,355 is carried forward. Meeting to-day (Friday).

The Atlas Electric & General Trust reports a net revenue for the year ended March 31st last of £198,761, as compared with £233,660 in the preceding year, to which is added £33,378 brought in, making £232,139. The preference dividend requires £159,469, and it is proposed to pay an ordinary dividend of one per cent. (against 3 per cent.), and to carry forward £44,889. Meeting: July 7th.

W. & T. Avery, Ltd., report a profit of £156,289 for the year ended March 31st last (against £163,305 in 1930-31). It is proposed to pay a final ordinary dividend of 10 per cent., making 15 per cent. for the year, and to carry forward £54,797 (£56,268).

Chadburn's (Ship) Telegraph Co., Ltd., reports a loss for the year ended March 31st last of £2,777 (as against a profit of £4,673 for 1930-31), which is deducted from an amount brought in, leaving a credit balance of £1,513.

The Oxford Electric Co., Ltd., has announced an ordinary dividend of 7 per cent. (same).

The Notting Hill Electric Lighting Co., Ltd., has declared an interim of 4 per cent. on the ordinary shares.

Stocks and Shares

TUESDAY EVENING.

THE end of the first six months of the year brings normally a slight tightening of money rates, with a consequent disposition on the part of gilt-edged stocks to give way to lower levels. So far from this being the present case, it must be said that the tendency is in an exactly contrary direction, for capital continues to pour into money-stocks, and very few days pass which do not contribute to the appreciation of prices. All of which is simply another way of saying that public anticipation looks for the 5 per cent. War Loan to be converted at some early date, and in advance of the official announcement investors are selling their War Loan in order to utilise the money elsewhere. This accounts for the pronounced strength of British Government and similar stocks, a condition which is reflected in industrial debenture stocks, preference shares, and such first-class ordinary issues as those contained in the electricity supply lists.

One of the outstanding features in the gilt-edged market has been the further improvement in the price of Central Electricity new scrip. This has risen to 2½ premium, showing a gain of 1½ on the week. Other stocks of kindred character are equally strong. Of the Home Railway debentures, Metropolitan District 5 per cents. have risen to 8½, and Metropolitan fives to 8 premium. Both stocks were issued, it may be recalled, at 97½. The Metropolitan District stock is regarded as being the better security of the two, but there is so little in it, as the phrase goes, that investors make no great discrimination between the two in the endeavour to obtain supplies of the stocks—supplies which are already running short. District 5 per cent. redeemable debenture stock, 1933-1943, is quoted ex dividend at 105½, and the two Metropolitan 3½ per cent. debenture stocks stand at 74.

Home Railway Dividend Estimates

Metropolitan consolidated stock has risen 3 points to 54½. Notwithstanding the very substantial rise which has taken place during the past few weeks, the erratic character of the movements, and the numbers of rumours that have been in force claiming to explain the boomlet, the company preserves silence in regard to any reason for the rises which have occurred in the price of the stock. Districts and London Electrics are 2 down, at 48½; Underground Electrics remain dull at 16s. Market estimates of the dividends in respect of the half-year which will end on Thursday in this week are inclined to think that the distributions of a year ago will be repeated. Metro-

politan consolidated then received 1 per cent. and Districts 2½ per cent. The dividend on the Underground shares was 3 per cent.

British Electric Traction deferred ordinary stock at 250 is quoted nominally 400 points lower, this being due, of course, to the distribution of the bonus stock, pound for pound, which doubled the deferred issue and automatically halved the price. In other British public traction issues, no particular interest is being taken at the moment.

Home Electricity Supply Shares

Westminster ordinary are 6d. higher at 28s. 6d. Apart from this, no alterations are marked in the prices of London Electricity Supply Companies' shares. It will be noticed, by reference to our price-lists, that the yield on the money, in the case of the London shares—*e.g.*, Charing Cross, Kensington, St. James'—is well under 5 per cent. The companies are beginning to declare their interim dividends, and these are likely to be, as a whole, at the rate of 7 per cent. per annum. It is thought that the London companies may be able, even in this first year of the working of the new Act, to pay more than the 7 per cent. standard dividend to which they are tied unless the consumers also receive some degree of benefit under the sliding scale. But in the calculations made of yield, we adhere to the 7 per cent. rate as being the basis for working out the returns available on money invested at current prices.

County of London new ordinary shares at 2s. premium are better, Scottish Power new preference at 1s., premium, and British Power new preference at their par price of £1 show little change. Edmundson's new preference strengthened to 6d. premium on the absorption of a fairly large line of shares which had been in the market since the issue was made. Midland Electric Power ordinary shares are 6d. easier at 29s. 6d., Newcastle-on-Tyne 7 per cent. preference improved to 28s., putting the shares on to a 5 per cent. basis of yield. The Oxford Electric Company has declared a dividend of 7 per cent., the same as that of a year ago. The price of the shares is quoted at 24s., and the 6 per cent. preference shares stand at £1. Electrical Distribution of Yorkshire new shares are 4s. premium.

Most of the debenture stocks in this section have been advanced about a point apiece.

Cables and Wireless

American Telephone and Telegraph shares have gone back to 115, but Internationals show a gain at 5½. Imperial and International Communications, and the Marconi Company, are stated to have signed an agreement with the Chinese Ministry of Communications for the installation on the outskirts of Shanghai of a beam wireless station. This, it is intended, shall be used for international radio telegraphy, more particularly with Great Britain. The traffic return for the month of May again showed a decrease, which disappointed the holders of Cables and Wireless preference. The price had been up to 45½, but reacted a point, leaving it 2 up on the week. Globe Telegraph and Trust advanced a further 5s. to 3¾. Marconi Marines held their improvement at 24s. 6d. There is no recovery in the stocks of the Anglo-American Telegraph Company, the recent falls in which were caused by a passing of its dividend by the Western Union Telegraph Company, which guarantees the dividends on the Anglo-Americans. Oriental Telephones continue dull at 2¾. The 7 per cent. preference shares have been changing hands around 23s.

Dollar and Foreign Stocks

The foreign stocks remain weak, Mexican Light & Power common, at 5, shows a drop of 5 points, and Mexico Tramways 5 per cent. bonds at 16½ are 4 down. The news from Mexico continues to be the reverse of satisfactory, and the effect of a little offering of stock in the market is out of proportion to the volume of business transacted. Tokyo Electric sixes are 2½ down at 53.

Power Corporation of Canada has passed the dividend on its common stock for the quarter ending July 30th. Of late, the dividends have been at the rate of 2 per cent. per annum. The shares are quoted at 7. Shawinigans are 12. Whitehall Electric preference continue flat at 12s., the confidence of holders having been shaken severely by the conditions in North and South America, Greece and Spain, where the Whitehall Electric has holdings in operating companies.

Manufacturing and Equipment

Henleys have risen to 5¼, showing a rise of 5s. on the week, and there is a better tendency about this market as a whole. General Electric ordinary are up to 35s., the reduction of 2 per cent. in the dividend having a bracing, rather than an unfavourable, effect upon the price. Associated Electrical Industries ordinary strengthened to 17s. Crompton Parkinsons are 1/16 better at 17s. 6d. There has been a fair amount of inquiry for good class preference shares. Shareholders of the Telegraph Construction & Maintenance Company have agreed to the proposed return of £7 per share of their capital. Ever Ready old and new shares keep firm at 21s. 3d.

The Atlas Electric & General Trust has announced a dividend of 1 per cent. on the ordinary shares, as against 2 per cent. in the previous twelve months. The price of the ordinary shares is 6s. 6d., and of the 7 per cent. preference 15s. 6d. Amongst iron and steel shares, Babcock and Wilcox are 1/16 lower at 36s. 3d., and Vickers are heavy at 5s. 3d. There is a slightly better tendency amongst rubber shares, in consequence of the stocks of rubber on hand showing a reduction.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price. June 28.	Rise. or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	60/9	—	4 18 9
Brompton Ordinary	1	8½	8½	28/–	—	5 0 0
Central Electricity 4½% Deb.	Stock	4½	4½	98	—	4 11 10
Charing Cross Ordinary	1	8½	8½	29/6	—	4 15 0
Chelsea	1	8¾	8¾	27/6	—	5 1 10
City of London	1	10	10	38/3	—	5 4 7
Clyde Valley	1	8	7	27/6	—	5 1 10
County of London	1	11	10½	41/3	—	5 1 9
Edmundsons' 7% Pref.	1	7	7	26/6	—	5 5 8
Elec. Dis. Yorkshire	1	9	9	35/–	—	5 2 10
Elec. Supply Corporation	1	11	11	47/6	—	4 12 7
Kensington Ordinary	1	8	8	28/6	—	4 18 3
Lancs. Light and Power	1	6½	7	26/3	—	5 6 8
London & Home Counties 4½% Deb.	Stock	4½	4½	98	—	4 11 10
London Electric	1	9	9	28/6	—	4 18 3
Metropolitan	1	10	10	42/–	—	4 15 3
Midland Counties	1	7	7	28/9	—	4 17 5
Mid. Elec. Power	1	8	8	29/6	–6d.	5 8 6
Newcastle-on-Tyne Ordinary	1	6	6	23/3	—	5 3 3
Do. 7% Pref.	1	7	7	28/–	+6d.	5 0 0
Northampton	1	10	10	40/9	—	4 18 2
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	25/–	—	4 16 0
St. James' and Pall Mall	1	8	8	29/–	—	4 16 7
Scottish Power	1	8	—	28/3	—	5 13 3
South London	1	8½	8½	28/6	—	4 18 3
Urban Ordinary	1	7	—	28/9	—	4 17 5
Westminster Ordinary	1	8½	8½	28/6	–6d.	4 18 3
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	12/–	—	12 10 0
Yorkshire Elec.	1	8	8	33/9	—	4 14 10
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	73½	—	5 8 10
Metropolitan		3½	2½	54½	+3	4 11 9
Do. District	„	5	4½	48½	–2	9 6 0
Underground Electric	1	8	7	16/–	—	8 15 0
TELEGRAPHS AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	110	–5	8 3 8
Anglo.-Am. Tel. Pref.	Stock	6	6	90	—	6 13
Do. Def.	„	1½	1½	20½	—	7 6
Cables & Wireless 5½% Pref.	„	5½	Nil	44½	+2	—
Do. A 7½% Ord.	„	—	Nil	14	—	—
Do. B Ord.	„	—	Nil	7	—	—
Globe Tel. and T. Ord.	10	8½	Nil	3¾	+¼	—
Do. do. Pref.	10	6	6	6¾	+¼	8 17 10
Great Northern Tel.	10	20	20	22½	+½	8 17 10
Marconi-Marine	1	15	10	24/6	—	8 3 1
Oriental Telephone Ord.	1	12	12	2⅜	—	•5 1 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	—	—	3/9	—	—
Do. do. 2nd Pref.	5	—	—	3/9	—	—
Do. do. 5% Deb.	Stock	—	—	7	—	—
British Electric Traction Def. Ord.	„	5	5	250xd.	–75	—
Do. do. Pref. Ord.	„	8	8	122½	—	6 10 6
Brazil Traction	100	—	—	11½	—	—
Brit. Columbia Elec. Rly Pfce.	Stock	5	5	86½	–2	5 15 7
London & Sub. Trac. 5% Pref.	1	Nil	Nil	3/9	—	—
London United Tram Deb.	Stock	4	4	56½xd.	—	7 1 7
Mexico Trams, 5% Bonds	—	5	5	16½	–4	30 5 10
Mexican Light Common	100	Nil	Nil	5	–5	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	51½	—	9 14 2
Victoria Falls Ord.	1	15	15	60/–	—	5 0 0
Yorkshire (West Riding)	1	Nil	Nil	5/–	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	4	17/–	+9d.	4 14 2
Do. Pref.	1	8	8	28/–	—	5 14 4
Babcock & Wilcox	1	15	14	36/3	–1/16	7 14 6
British Aluminium Ord.	1	10	5	20/–	—	5 0 0
British Insulated Ord.	1	15	15	53/9	—	5 11 6
Brush Ord.	Stock	5	Nil	47	—	—
Callender's	1	15	15	52/6	—	5 14 3
Do. 6% Pref	1	6½	6½	25/-xd.	—	5 4 0
Crompton Parkinson Ord.	5/–	30	24	17/6	+1/16	6 17 2
Do. 8% Pref.	1	8	8	27/6	—	5 16 5
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	92½xd.	—	5 8 1
Electric Construction	1	Nil	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	3 1/16	—	7 19 9
English Electric	1	Nil	Nil	8/9	—	—
Do. do. Pref.	1	Nil	Nil	10/–	—	—
Ever Ready	5/–	35	35	21/3	—	8 5 6
Ferranti Pref.	1	7	7	22/–	—	6 7 3
G.E.C. Pref.	1	6½	6½	26/–	+6d.	5 0 0
Do. Ord.	1	10	8	35/–	+1/16	4 11 5
Henley's	1	30	30	5¼	+¼	5 14 3
Do. 4½ Pref.	5	4½	4½	4½	—	5 0 0
India-Rubber	1	Nil	Nil	4/6	—	—
Johnson & Philips	1	10	5	⅞	—	6 13 4
Siemens Ord.	1	7½	7½	19/6	–6d.	7 13 10
Telegraph Construction	12	Nil	Nil	9½	—	—

• Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1930

35631. "Electrical machines." Siemens & Halske Akt.-Ges. November 29th, 1929. (374074.)

1931

1864. "Current transformer systems." W. W. Triggs (Ohio Brass Co.). January 20th, 1931. (373997.)

2931. "Arc extinguishing devices." British Thomson-Houston Co., Ltd. January 29th, 1930. (374000.)

3143. "Electric cut-outs." Appareillage Gardy Soc. Anon. January 31st, 1930. (374079.)

3859. "Television and like apparatus." Marconi's Wireless Telegraph Co., Ltd., and H. M. Dowsett. February 6th, 1931. (374094.)

5613. "Thermionic valve circuits." Pye Radio, Ltd., E. V. Root, and J. M. H. Maxey. February 23rd, 1931. (374006.)

5643. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 25th, 1930. (374007.)

5666. "Electric hammers." C. Muller. February 23rd, 1931. (374062.)

5674. "Ignition of gas burners by electric means." Electro-gaz Soc. Anon. June 18th, 1930. (374009.)

5675. "Ignition of gas burners by electric means." Electro-gaz Soc. Anon. November 22nd, 1930. (Addition to 374009.) (374053.)

5800. "Electric power-converting apparatus." British Thomson-Houston Co., Ltd. February 24th, 1930. (374012.)

5806. "Means for preventing disturbances due to acoustic back coupling in electric musical instruments with relay control." Siemens & Halske Akt.-Ges. February 25th, 1930. (374013.)

5947. "Picture telegraph systems and apparatus for use therein." Telefunken Ges. für Drahtlose Telegraphie. March 15th, 1930. (374015.)

6012. "Static transformer for changing a polyphase alternating current supply to a multiphase output of any required number of phases." E. Cameron. February 26th, 1931. (374019.)

6208. "Armatures of rotary electric machines." Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd., and P. D. Ionides. February 27th, 1931. (374030.)

6283. "Electrically heated hot water reservoir with one or more thermostats." Naamlooze Vennootschap Fabriek Van Instrumenten en Electrische Apparaten Inventum. March 21st, 1930. (374082.)

6351. "Electric lighting systems for self-propelling vehicles." Lite Watchman Corp. March 5th, 1930. (374099.)

6598. "Electric ignition coils and similar spark discharge windings." British Thomson-Houston Co., Ltd., and L. Griffiths. March 3rd, 1931. (374106.)

6599. "Electric screening for sparking plugs of internal-combustion engines." British Thomson-Houston Co., Ltd., W. E. Gough, and J. H. Pollard. March 3rd, 1931. (374107.)

6712. "Television and like systems." J. L. Baird and Baird Television, Ltd. March 4th, 1931. (Cognate application 13646/31.) (374114.)

6739. "Condenser microphones." General Electric Co., Ltd., and D. A. Oliver. March 4th, 1931. (374115.)

6740. "Portable electric inspection lamps." General Electric Co., Ltd., A. W. Corneck, and H. T. Steggles. March 4th, 1931. (374116.)

6807. "Thermionic devices." P. Freedman. March 5th, 1931. (374126.)

6846. "Regenerative vacuum tube amplifiers." Standard Telephones and Cables, Ltd. May 1st, 1930. (Patent of Addition not granted.) (374130.)

6847. "Submarine cable system." R. E. A. Putnam and International Communication Laboratories, Inc. March 5th, 1931. (374131.)

6848. "Electric discharge devices." Standard Telephones and Cables, Ltd., L. H. Bedford, and D. G. Coveney. March 5th, 1931. (374132.)

7045. "Electrostatic apparatus for separating particles of dust in suspension in a gaseous fluid." J. Bremond. March 24th, 1930. (374145.)

7054. "Electric totalisators." Automatic Electric Co., Ltd., L. M. Simpson, and J. W. McClew. March 6th, 1931. (374146.)

7242. "Electrodes or welding rods for use in electric arc welding." Quasi-Arc Co., Ltd., and A. P. Strohmenger. March 9th, 1931. (374160.)

7290. "Control systems for electrically driven reciprocating motions." British Thomson-Houston Co., Ltd., and W. B. Green. March 9th, 1931. (374162.)

7525. "Tuned or resonance spring blades or reeds chiefly designed for use in electromagnetic resonance spring driving mechanisms." Landis & Gyr Soc. Anon. March 12th, 1930. (374168.)

7877. "Electric ceiling-roses and the like." R. Nettl and D. H. Nettl. March 14th, 1931. (Addition to 329791.) (374174.)

8659. "Electrical reproducer devices for use with gramophone records." Pacent Electric Co., Inc. October 10th, 1930. (374180.)

9001. "Wireless direction finding systems." N. F. S. Hecht. March 24th, 1931. (374182.)

9502. "Electrolytic condensers." Condenser Corporation of America. March 28th, 1930. (374188.)

10907. "Electrical resistances." Wunderlich & König Ges. April 12th, 1930. (374198.)

10926. "Thermally operated electric switches." H. C. Sanders. April 14th, 1931. (374199.)

12118. "Electrical resistances." Wunderlich & König Ges. September 20th, 1930. (Addition to 374198.) (374215.)

12200. "Alternating current dynamo-electric machines." D. B. Hoseason, S. Dale, and Associated Electrical Industries, Ltd. April 24th, 1931. (374216.)

12368. "Mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. May 26th, 1930. (374217.)

13290. "Imitation fuel for electric fires and radiators." H. H. Berry. May 5th, 1931. (374224.)

13543. "Electric charge tubes." C. H. F. Muller Akt.-Ges. May 10th, 1930. (374227.)

14901. "Methods of manufacturing oxide cathodes for use in thermionic valves and other electric discharge devices." Telefunken Ges. für Drahtlose Telegraphie. May 20th, 1930. (374241.)

15148. "Electrical systems for internal combustion engines." Eclipse Machine Co. May 23rd, 1930. (374246.)

15210. "Method and means for the automatic regeneration of received telegraph signals." T. C. V. Nielsen. May 22nd, 1931. (374248.)

15526. "Adjustable or tuning inductances for radio receiving apparatus." E. K. Cole, Ltd., E. J. Wyborn, and A. W. Martin. May 27th, 1931. (374253.)

15601. "Electrical step-by-step direct current motor systems." Barr & Stroud, Ltd., and J. W. French. May 28th, 1931. (374254.)

16566. "Rocking contact members of electrical switches." Wandsworth Electrical Manufacturing Co., Ltd., T. Batchelor, and A. B. Smith. June 6th, 1931. (374272.)

17862. "Controllers for electric motors." R. G. Lockett. June 21st, 1930. (374289.)

17994. "Improvements in or relating to gaseous electric discharge lamps." R. Macey. June 22nd, 1931. (374291.)

17999. "Electric regulating switches." A. S. Anfinnsen, J. B. Oftedal, and E. Brodahl. June 22nd, 1931. (374292.)

18249. "Radio reception apparatus." A. W. Macnamara. June 24th, 1931. (374294.)

19576. "Electric lamps." General Electric Co., Ltd. August 8th, 1930. (374305.)

19923. "Lighting apparatus." B. Peizel. July 10th, 1930. (374308.)

20235. "Electric oscillation generators." Marconi's Wireless Telegraph Co., Ltd. July 14th, 1930. (374311.)

22132. "Electric relays." Tyer & Co., Ltd., and J. W. Punter. August 4th, 1931. (374323.)

23822. "Electrodynamic loudspeakers." A. A. Thornton (Magnavox Co.). August 24th, 1931. (374335.)

24781. "Methods of and apparatus for arc welding." British Thomson-Houston Co., Ltd. September 4th, 1930. (374339.)

24898. "Selector tuning devices for radio receiving sets." Fabrica Italiana Magneti Marelli. September 23rd, 1930. (374340.)

26695. "Mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. September 29th, 1930. (374351.)

32837. "Electrical measuring apparatus for determining the average voltage of a consumer's circuit during definite periods of time." Landis & Gyr Soc. Anon. December 16th, 1930. (Addition to 366419.) (374368.)

33357. "Lubricating arrangements of magnetic electric ignition apparatus." R. Bosch Akt.-Ges. December 19th, 1930. (374371.)

33382. "Elevator door operator." Waygood Otis, Ltd. (Otis Elevator Co.). February 24th, 1931. (Divided application on 374066.) (374073.)

35691. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 3rd, 1931. (374381.)

1932

1236. "Sparking plugs for internal combustion engines." M. T. Green. October 19th, 1931. (Divided application on 369653.) (374385.)

1490. "Electrically driven compressors for refrigerating apparatus." Lipman Patents Corporation. February 14th, 1930. (Divided application on 373645.) (374042.)

2807. "Television apparatus." A. Karolus. February 2nd, 1931. (374391.)

4393. "Connection system for screened grid valves." D. S. Radioaktienges, Loewe, and P. Kapteyn. May 21st, 1930. (Divided application on 370707.) (374395.)

6366. "Television and like systems employing cathode ray tubes." Telefunken Ges. für Drahtlose Telegraphie. March 2nd, 1931. (374400.)

8166. "Electric switches with means to prevent arcing." Ferranti, Ltd., and G. R. Z. de Ferranti (legal representative of S. Z. de Ferranti (deceased). November 25th, 1930. (Divided application on 369959.) (374057.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 15th:—

Invicta. No. 530225. Class 6. Vacuum cleaning machines, floor polishing and waxing machines, electric fans, and hair dressing machines.—I.V.C. Co., Ltd., 35, Great Tower Street, E.C.3, and Cray Works, High Street, Bexley, Kent.

Wearite (lettering and design). No. 526572. Class 8. Parts of wireless telephonic, telegraphic, television, sound reproducing, and sound recording apparatus. No. 529450. Class 13. Switches (ordinary), jacks, plugs, screens, and earthing tubes. —Wright & Weaire, Ltd., 740, High Road, Tottenham, N.17.

Creda. No. 530773. Class 8. Electric cables and flexibles.—Credenda Conduits Co., Ltd., Credenda Works, Rood End Road, Oldbury, Birmingham.

Babyvisor. No. 531386. Class 8. Apparatus for use in transmitting images and scenes and/or sounds to a distance by telegraphy and telephony.—Baird Television, Ltd., 133, Long Acre, W.C.2.

Skyscraper. No. 532092. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Lissen, Ltd., Worple Road, Isleworth, Middlesex.

Cruiser. No. 528412. Class 13. Electric switches (ordinary) and lamp shades, reflectors, standards, holders, and connectors, &c.—Electric Lamp Service Co., Ltd., Stal House, Judd Street, King's Cross, W.C.1.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Houses (70), Wales Farm Estate (£26,850); Hoad and Son, Wembley.

Aldwick (BOGNOR REGIS).—Church (£11,000); incumbent.

Annfield Plain (DURHAM).—Houses (82), West Kyo, for U.D.C. (£24,360); J. Wear & Son, builders, Pelton.

Basingstoke.—Houses (84), South Ham; borough surveyor. Remodelling Town Hall (£2,154); Norris & Co. (Builders), Ltd., Sunningdale.

Bexhill-on-Sea.—Front development scheme (£122,500); Tubbs and Messer, architects. Pumping station, Cowbeech (£11,040); borough surveyor. Shops and flats, Cooden Sea Road; J. E. Maynard, architect.

Billingham-on-Tees.—Nurses' home; R. R. Kitching, 21, Albert Road, Middlesbrough.

Birkenhead.—Extensions to garage and showrooms, Hamilton Street, for W. Watson & Co. (Liverpool), Ltd.; D. A. Bevereidge, architect, Prudential Buildings, 36, Dale Street, Liverpool.

Birmingham.—Rebuilding of premises, High Street, for A. M. Chapman; Bryant & Son, builders, Whitmore Road, Small Heath.

Blaydon-on-Tyne.—Houses for U.D.C.; T. Mastaglio, surveyor.

Blyth (NORTHUMBERLAND).—Houses (100), South Farm Estate (£23,466); L. Leeper, borough surveyor.

Bollington (CHESHIRE).—Houses (22); U.D.C. surveyor.

Bolton.—Congregational church, Tonge Moor, Starkie Road; B. Gass & Hope, architects, 19, Silverwell Street.

Bootle (CUMBERLAND).—Estate development, Fernhill Road; North Western Estates Development, Ltd. Estate development, Stuart Road; J. L. Rawsthorne & Co., Liverpool.

Bournemouth.—Cinema, Charminster Road and Malmesbury Park Road; P. V. Seward.

Cheltenham.—Development of Avenue Estate, Charlton Kings; A. C. Bendall.

Chester.—Houses (42), Hoole Road; Williams, Son & Co., Ltd.

Coventry.—Offices, Hertford Street, for the Pearl Assurance Co., Ltd.; W. R. Lane & Co., Ltd., builders, Fisher Road.

Cumnock & Holmhead (AYRSHIRE).—Houses (56), with electrical work; R. D. Hunter, town clerk.

Cupar.—Houses (24), Kinloss; A. D. Haxton, architect, Commercial Road, Leven.

Durham.—Conversion of schoolrooms at West Cornforth into cinema for W. W. Turnbull; G. L. Salkeld, 11, Kensington Gardens, Ferryhill. Alterations and extensions to Benfieldside Council School; F. Willey, architect, 34, Old Elvet.

Ealing (MIDDLESEX).—Development of Hanger Gill Estate for Haymills, Ltd.; Welch, Cachenaille-Day & Lander, architects, 7, New Square, Lincoln's Inn, W.C. Divisional offices and depôt, Western Avenue; county engineer. Shops and flats, The Broadway; E. R. Taylor, architect, 5, Manchester Square, W.

East Retford.—Houses (66), Hallcroft and Lidgett Lane Estates; R. E. Wilson, borough surveyor, Municipal Offices.

Edinburgh.—Branch premises, Musselburgh, for the Co-operative Society, Ltd., 21, North High Street; company's architect.

Essex.—Junior school and extensions, Sutton's Institution, Hornchurch, and casual wards, Braintree (£5,332); county architect, Chelmsford.

Falkirk.—Business premises, Chamelon Road; J. G. Callander, architect, 1, Newmarket Street.

Fleetwood.—Houses (100), Flakefleet Estate; W. Melville, U.D.C. surveyor.

Garstang (LANCS).—Branch bank for the District Bank, Ltd.; T. Croft & Sons, Ltd., builders, Blackpool Road, Preston.

Gillingham (KENT).—Two subsidiary pumping stations; W. H. Radford & Son, engineers, Albion Chambers, King Street, Nottingham.

Glasgow.—Houses (80), various estates; housing director. Baths, Barrowfield Street (£35,000); city engineer and trade contractors. Bakery for the Caledonia Oatcake Baking Co., Ltd.; A. Gardiner & Gardiner McLean, architects, 134, Bath Street. Buildings, Cartyne Road, for the Scottish Greyhound Racing Co., Ltd., 62, London Wall, E.C.2. Cinema, Bedford Street; Lennox & McMath, architects, 103, Bath Street. Reconstruction work, Maxwell Street, Argyle Street, and Dunlop Street; Lewis's Royal Polytechnic, Ltd.

Glossop.—Estate development, Ashes Lane; S. Goddard and Sons.

Goole.—Alterations to County Poor Law Institution; West Riding architect, County Hall, Wakefield.

Gravesend.—Houses (24). Canal site; borough engineer. Alterations and additions, 4, 5 & 6, East Milton, for Co-operative Stores; L. G. Ekins.

Grimsby.—Houses, Nunsthorpe (£28,613); Steel and Goddard.

Hamilton.—Housing scheme, Burnbank (with electrical work); borough surveyor.

Hampshire.—Junior school, Titchfield, for the County E.C.; A. L. Robert, county architect, Winchester.

Hayes (MIDDLESEX).—Re-erection of works, for Scott Preserve Makers, Ltd.

Herne Bay.—Premises for Midland Bank Ltd., Town Hall site; Whinny, Son & Austin Hall.

Huddersfield.—Offices, Ramsden Street; borough engineer.

Kent.—Nurses' home, Dartford Hospital, for the C.C.; W. H. Robinson, county architect, Springfield, Maidstone.

Kidderminster.—Houses (100), Broadwaters Estate; borough engineer.

Leamington.—New block, Warneford Hospital, Radford Road, Leamington Spa (£6,165); Armstrong & Gardner, architects, 39, High Street, Warwick.

Leeds.—Offices and works, Wharfe Street, for Crosland & Co., 70A, Kirkgate; Kitson, Paris, Ledgard & Pyman, architects, Lloyds Buildings, Vicar Lane.

Lee-on-Solent (HANTS).—Re-erection of pier pavilion, electrically equipped (£35,000), for Lee-on-Solent Properties, Ltd.; A. H. Kaye, manager.

London.—(BERMONDSEY).—Flats (68) and shops (5), Redriff Estate (£41,000); borough engineer. (DEPTFORD).—Additions, South Eastern Hospital, Avonley Road; Horder & Son. (LEWISHAM).—Development of Hall Park Estate, Bromley Road; Forster Estate Development Co. (STOKE NEWINGTON).—Factory, Shelford Place; A. J. King, Ltd. (TOTTENHAM).—Houses (57), Booker Estate; A. Robinson. Extensions to 456-460, High Road; F. W. Woolworth & Co., Ltd. Extensions to St. Katherine's College, White Hart Lane; trustees.

Manchester.—Extensions to Home of Our Lady of Lourdes, Didsbury Lodge, Wilmslow Road, Didsbury; Moston Brick and Building Co., Ltd., builders, Kenyon Lane, Moston. Shopping site, Crowcroft Estate, Longsight; J. W. Maunders, builder, 21, Grange Avenue, Stretford. School premises, Manchester Cathedral; T. Worthington & Sons, architects, 178, Oxford Road.

Mansfield.—Factory for the Whiteley Electric Radio Co., Ltd., Nottingham Road; A. Lane, Son & White, architects, Leeming Chambers, Leeming Street.

Middlesbrough.—Alterations and additions to the Market Place Centenary Church; Kitching & Co., architects, 21, Albert Road. School, Whinney Banks Estate; S. E. Burgess, borough engineer, Town Hall. Extensions to premises of the Lionweld Steel Flooring & Stairway Co., Marsh Road; Hugills Forge, Thornaby-on-Tees.

Newcastle-on-Tyne.—Premises in Erick Street, for Higginbottom Co.; S. Miller, Ltd., builders, 17, North Street.

Newton-in-Makerfield.—Houses (100), Park Road; J. Elston, architect, 18, Queen Street, Earlestown.

Northfleet (KENT).—Factory extension, Crete Hall Road; Henley's Tyre & Rubber Co., Ltd.

North Shields.—Houses and shops; W. Stockdale, architect, 73, Howard Street.

Northumberland.—Houses for the Aged Miners' Homes Association (£25,000); W. Dixon & Son, architects, Collingwood Street, Newcastle. Schools, Broomhill (£7,470) and Guide Post, for the County E.C.

Norwich.—Fire station and police section house (£36,000); S. Livock, architect. Rehousing distillery (£18,000); city engineer.

Ossett (YORKS).—St. Ignatius' Church; Holtom & Fox, architects, Union Street, Dewsbury.

Paisley.—Church on the Paisley and Glasgow Road; Rev. G. Kerr McKay, Johnstone.

Pembrokeshire.—Elementary school, Solva; O. Thomas, county architect, County Offices, Haverfordwest.

Penrith (CUMBERLAND).—Alterations and additions to the Pack Horse Hotel; R. Morton-Rigg, architect, Cornay Square.

Perivale (MIDDLESEX).—Shopping centre, Percy Bilton Estate; T. P. Bennett & Son, architects.

Portsmouth.—Alterations and improvements to the workshops for the blind, Northern Road, Cosham; R. Corke, Ltd., builders, Rugby Road.

Prescot.—Works for the British Copper Refiners, Ltd.

Preston.—Extension of out-patients' and X-ray departments at the Preston Royal Infirmary, Deepdale Road; C. M. Lillie, architect, Brown Edge, Bamber Bridge.

Rossendale (LANCS).—Extensions to factory premises of N. Worsley, Ltd., Clough End Mill, Haslingden.

Rotherham.—Building, Wellgate, for Abbey Glen Laundry, Co., Ltd.; T. Wilkinson & Sons, Ltd., builders, Olive Grove Works, Sheffield.

Roundthorn (LANCS).—Church (£5,600); I. Taylor & N. C. Young, architects, Chapel Walks, Manchester.

St. Albans (HERTS).—Extensions to casual wards (£3,399); Humphreys, Ltd., Knightsbridge, S.W. Extensions to Os' Institution (£29,000); A. Saxon Snell & Phillips, architects.

Salford.—Factory, Woden Street, Regent Road, for the Greengate & Irwell Rubber Co., Ltd., Orsall Lane (£8,400); J. Fearnley & Sons, Ltd., builders, Eccles New Road.

Selby.—Children's ward, the War Memorial Hospital, Brayton Road (£2,000); L. T. Moore, architect, 3, Raymond Buildings, Gray's Inn, W.C.1.

Slaithwaite.—Reconstruction of mill premises; Pogson & Co., Bridge Mills.

Southend-on-Sea.—Mental hospital, Runwell; Elcock & Sutcliffe, architects, Adam House, 60, Strand, W.C. Covered market, with arcade of shops; J. Sumner & Co., builders, Thorpe Bay.

South Shields.—Houses (36), Lisle Road; J. H. Woolgar, builder.

Stafford.—Cinema, Newport Road; W. J. Dudley, architect, Brooklands, Tillington.

Stockport.—Extensions to infirmary, Wellington Road South; M. Lane & Co., Ltd., builders, Heaton Lane.

Sunderland.—Houses, Southwick, Carley Hill, Commercial Road, and Pallion; T. P. Collinge, borough surveyor.

Surrey.—School (£33,217), St. Helier; H. Hann, builder, Wimbledon. Central school, Banstead; W. W. Finny, secretary to County E.C., Kingston-on-Thames.

Swadlincote.—Houses (32); G. A. Taylor, housing architect.

Swansea.—Development of Glanglas Estate; T. G. Spragg.

Tanfield (DURHAM).—Houses (40); J. R. Heslop, surveyor.

Taunton.—Houses (230); borough surveyor.

Thakeham (SUSSEX).—Houses (24), Washington; A. Saunders, builder, Brighton.

Tunbridge Wells.—Re-erection of hosiery factory, Grovehill Road, for A. K. Goodwin & Son, and printing works, for the Courier Printing and Publishing Co., Ltd. (£100,000).

Tynemouth.—Alteration to the Plaza; J. L. Beckett, borough surveyor.

Watford.—Engineering improvements to Poor Law Institution; W. M. Binney, consulting engineer.

West Stanley.—Houses (100); A. Routledge, surveyor.

Whickham (DURHAM).—United Methodist Church, Sunniside; Shield Bros., Swalwell.

Wortley (NEAR SHEFFIELD).—Houses (100); F. Hurlby, R.D.C. engineer, Council Offices, Grenoside.